UNIVERSITY OF ALBERTA

An Experimental Investigation of the Effect of Accounting Discretion on the Reporting of Smooth Increasing Earnings by Managers

by

Hwee-Cheng Tan

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1 INTRODUCTION

1.1 OBJECTIVES OF THESIS

In order to maximise the value of their firm, managers sometimes manage earnings to communicate private information about future earnings and their variability to shareholders (Demski [1998], Chaney and Lewis [1995], Ronen and Sadan [1981]). One method of communication is to report smooth increasing earnings over time (Kirschenheiter and Melumad [2000], Barth et al. [1999], Chaney and Lewis [1995]). Recent studies by Francis, et al. [2003] and Barth, et al. [1999] show that investors place a high valuation on firms that report smooth increasing earnings. Smooth increasing earnings provide investors with information about the firm's cash flows and quality of earnings: a high level of reported earnings is an indication of a high level of expected permanent cash flows, while reported earnings that have a low variance are of higher quality (Kirschenheiter and Melumad [2000]).

Demski [1998] and Kirschenheiter and Melumad [2002] argue that the manager's knowledge of future earnings (or foresight) is important in the smoothing of earnings because it allows managers to make appropriate inter-period transfers in earnings. Demski also suggests that this knowledge can be acquired through the diligence of managers (for instance, gathering information about customers' demands). Managers without foresight are less able to smooth earnings. The positive association between smoothing and foresight may perhaps explain why managers with foresight want to use the reporting of smooth earnings as a way to communicate their knowledge to

shareholders. High foresight managers can use the patterns of smooth earnings to distinguish themselves from low foresight managers in the capital markets.

Demski [1998], however, cautions that the availability of accounting discretion may make it easy for all managers to smooth earnings, regardless of their foresight level. When this happens, earnings patterns may not be useful in distinguishing between the two types of managers. The availability of accounting discretion facilitates the management of earnings in two ways. First, when accounting standards are flexible, managers find it convenient to use accounting estimation instead of the more costly operational variables to manage earnings (Nelson et al. [2002a]). Second, the subjectivity in accounting standards results in a greater willingness of auditors to accept non-conservative accounting practices by managers (Nelson et al. [2002a], Hackenbrack and Nelson [1996]). Given that firms benefit from reporting smooth increasing earnings, Chaney and Lewis [1995] and Demski [1998] argue that there are managers who, despite having limited knowledge about the future, will use accounting discretion to report smooth earnings similar to those reported by managers with foresight. These managers may want to secure the benefits for themselves such as extending their employment tenure (Arya et al. [1998], Fudenberg and Tirole [1995], Dye [1988]). In order to ensure that reported earnings provide useful information to investors, Demski [1998] and Sankar and Subramanyam [2001] suggest that accounting discretion be restricted. The first objective of this thesis is to investigate whether a reduction in accounting discretion brings about a separation in the earnings series reported by managers who have foresight (high foresight managers) from those who have limited foresight (low foresight managers).

The second objective of the thesis is to investigate whether a reduction in accounting discretion affects a manager's ability to communicate with shareholders through smooth increasing earnings when operational techniques are available. The availability of discretion allows managers to make accounting choices appropriate to their businesses so that reported earnings can convey information on economic earnings (Kirschenheiter and Melumad [2000], Dye and Verrecchia [1995]). A reduction in discretion is predicted to lessen a manager's ability to communicate with shareholders (Healy and Wahlen [1999], Schipper [1989]). Several studies (Nelson et al. [2002a], Lambert [1984]), however, show that both operational and accounting choices are employed in earnings management. A recent study by Barton [2001] finds that managers make substitutions between real and accounting variables when smoothing earnings. In addition, Nelson et al. [2002a] observe a dependence between the flexibility in accounting standards and the type of earnings management technique employed by managers. Managers tend to use operational variables when standards are precise (or inflexible), and accounting variables when standards are imprecise. A reduction in accounting discretion therefore need not necessarily prevent managers from achieving their earnings target, if managers have other earnings management instruments at their disposal.

The third objective of the thesis is to examine whether the length of the smoothing period (or smoothing duration) interacts with discretion and the type of manager to affect the ability of managers to report smooth increasing earnings. Barth et al. [1999] find that few firms in their sample are able to report a continuous increase in earnings for long periods of time. A recent study by Barton and Simko [2002] shows that when managers rely on accounting adjustments to overstate earnings, future reversals of the accounting

adjustments will constrain their ability to continuously overstate future earnings. As a result, managers have to make more accounting adjustments to off-set the reversals in order to maintain the same level of earnings over time. Based on Barton and Simko's findings, this thesis predicts that when accounting discretion is restricted, low foresight managers who rely on accounting adjustments to manage earnings may find it increasingly difficult to report smooth increasing earnings over time. With a high level of accounting discretion, however, managers may experience less difficulty in reporting smooth increasing earnings. Reversing adjustments are likely to have a smaller effect on high foresight managers because their knowledge about future earnings enables them to use both investments and accounting techniques to cope with these reversals. As a result, these managers are expected to be able to report smooth increasing earnings regardless of the length of the smoothing period and level of discretion.

1.2 CONTRIBUTIONS OF THESIS

This thesis complements archival research on earnings management by using an experimental approach to examine the effect of a reduction in accounting discretion on the ability of high foresight and low foresight managers to manage earnings. The experimental approach permits the manipulation of manager types and levels of accounting discretion in order to test hypotheses regarding these variables. The influence of these two variables is difficult to discern from reported earnings data (Fields et al. [2001]).

This thesis makes three contributions to the accounting literature. First, it provides experimental evidence in support of the results in Demski [1998], which suggest that a

reduction in accounting discretion leads to a separation in the pattern of earnings reported by high foresight and low foresight managers. The thesis additionally shows that the time period over which managers are required to smooth earnings interacts with discretion and the foresight of the managers to affect earnings patterns. Earnings patterns evaluated over longer durations and in a low discretion environment provide a clearer separation between high and low foresight managers. At longer durations, the earnings reported by low foresight managers in a low discretion environment are significantly lower and more volatile than those reported by high foresight managers. In contrast, at high levels of discretion, low foresight managers are able to report the same smooth earnings patterns as high foresight managers regardless of duration.

Second, this thesis extends Nelson et al. [2002a] and Barton [2001] by showing that accounting discretion influences operating decisions. Nelson et al. [2002a] and Barton [2001] show that operational and financial decisions of managers affect a manager's use of accruals to manage earnings, but do not explore the impact of accounting discretion on these decisions. The results in this thesis show that when accounting discretion is reduced, managers reduce their investments in assets such as research and development (R&D) expenditures in order to reduce the variability in operating earnings. This action minimises the manager's reliance on accounting adjustments. This thesis also provides support to Jamal et al. [2004] and Jamal et al. [2003] who find that a reduction in accounting discretion has an operational (hence, economic) impact on a firm. The thesis also complements a growing area of research which examines factors that influence a manager's operating policies. Some of the factors that have been investigated include the decision rules used by shareholders to price shares (Kanodia [1980]), the presence of

institutional shareholders (Bushee [1998]), and the form of compensation contracts (Demski and Dye [1999]).

Third, the thesis contributes to research that focuses on discretionary accruals (e.g. Subramanyam [1996], Jones [1991]) by showing that in a low discretion environment, a manager's choice of accounting adjustments can provide investors with information about the manager's knowledge about future earnings. Compared to high foresight managers, low foresight managers are found to use more income-increasing accounting adjustments with long reversal periods. High foresight managers, in contrast, use more income-decreasing accounting adjustments that have short reversal periods.

1.3 OVERVIEW OF RESEARCH METHOD

The three objectives of the thesis are investigated by conducting an experiment in which high foresight and low foresight managers are given different levels of accounting discretion to report smooth increasing earnings over time. One hundred experienced financial managers from ten industries participated in the experiment which had a 2×3 (managerial foresight $\times$ accounting discretion) between-subject design.

In the experiment, both types of managers are given the same motivation, which is to report smooth increasing earnings over time. The choice of this reporting objective is based on two findings in the literature: (1) smooth increasing earnings patterns are desired by investors who place a high valuation firms with such earnings (Francis et al. [2003] and Barth et al. [1999]), and (2) managers take actions to create such streams of earnings in order to maximize the value of their firms (Myers and Skinner [2002], Burgstahler and Dichev [1997], Ronen and Sadan [1981]). Another reason for including

the level of earnings in the objective is that if managers were to smooth earnings only without having to consider the level of earnings, a manager who smoothed a series of losses might be ranked equally with one who smoothed a series of positive earnings. Using reporting of smooth increasing earnings as an objective avoids this problem and ensures that managers will take value-maximizing actions.

The two types of managers are manipulated by providing full information about future earnings to the high foresight group and limited information to the low foresight group (Demski [1998], DeFond and Park [1997], Ronen and Sadan [1981]). High foresight participants are given information on future earnings by providing them with decision aids that predict future operating earnings. Low foresight participants are given decision aids with limited information about future earnings.

The amount of accounting discretion is manipulated by varying the percentage of operating earnings that can be affected by accounting adjustments. The participants are allowed to use both operational and accounting techniques in order to achieve their reporting objective. The operational techniques available in the experiment relate to the selection of assets that have an effect on cash flows of the firm, while accounting techniques relate to the timing of expense recognition which have no cash flow effect (Sivakumar and Waymire [2003], Nelson et al. [2002a]).

1.4 KEY RESULTS

The results from the experiment in this thesis show that a significant restriction in accounting discretion is effective in bringing about a separation in the earnings series reported by low and high foresight managers. At low levels of accounting discretion, low

foresight managers are unable to report smooth increasing earnings. In contrast, high foresight managers are less affected by a reduction in discretion: they alter their operational strategies in response to the available level of accounting discretion in order to achieve their reporting objective. When accounting discretion is low, high foresight managers reduce their investments in assets with variable returns and increase their investments in short-term assets with stable returns.

This thesis also shows that when there is a high level of discretion, low foresight managers are able to report earnings patterns that are similar to those of high foresight managers at every smoothing duration. However, when accounting discretion is reduced, the earnings reported by low foresight managers at longer smoothing durations are lower and more volatile than those reported by high foresight managers.

Additional results indicate that compared to high foresight managers, low foresight managers make more income-increasing adjustments and tend to use more accounting adjustments with long reversal periods in a low discretion environment. High foresight managers make more income-decreasing adjustments and use more accounting adjustments with short reversal periods in the same environment. The absolute level of accounting adjustments used by both managers, however, is not significantly different.

1.5 ORGANISATION OF THIS WORK

This thesis is organised as follows. Chapter 2 provides a literature review of income smoothing and accounting discretion. The development of the hypotheses is elaborated in Chapter 3. Chapter 4 provides the theoretical background for the experiment and the design of the computer program used in the experiment. Chapter 5 contains descriptive

statistics of the experimental sample and results of manipulation checks. The results of the test of four hypotheses relating to the reporting of smooth increasing earnings are described in Chapter 6. Chapter 7 provides sensitivity analysis of the results in Chapter 6. Chapter 8 reports and discusses the results of the test of hypothesis relating to the length of the smoothing period. Finally, a discussion of the implications and limitations of the thesis is presented in Chapter 9.

2 LITERATURE REVIEW

2.1 INTRODUCTION

Accounting information is used in securities pricing, managerial compensation contracts, debt contracts, and labour negotiations. The availability of choices within GAAP and the latitude of auditors enable managers to use accounting techniques to manage accounting information in order to affect the outcome of these contracts and events (Nelson et al. [2002b], Watts and Zimmerman [1986]). The motivation for managing accounting choices can be value-maximising or opportunistic (Fields et al. [2001]). A value-maximising manager uses discretion in GAAP to make accounting choices that communicate private information about future earnings to shareholders (Demski [1998], Subramanyam [1996], Chaney and Lewis [1995], Trueman and Titman [1988]); an opportunistic manager uses discretion to misrepresent the firm's performance in order to achieve personal objectives (Fields et al. [2001]). Income smoothing is generally considered a value-maximising activity by investors: recent research finds that firms with smooth income streams have higher valuation than firms that do not have such earnings patterns (Francis et al. [2003], Subramanyam [1996]). In contrast, managers who manage earnings in order to meet bonus targets (Healy [1985]) or to avoid violations of debt covenants (DeAngelo et al. [1994]) are commonly regarded as opportunistic managers.

One of the earliest studies on income smoothing is by Gordon [1964] who proposed a theory of accounting choice. Gordon's theory rests on the premise that managers are

compensated on stock performance, and that stock prices are a function of the level of earnings, the rate of growth of earnings, and the variance of earnings changes. Consequently, managers would be motivated to make accounting choices that not only increase reported earnings and its growth rate, but also reduce the variance of earnings changes. Several studies have attempted to test the validity of Gordon's theory on reduction of earnings variability. This aspect of the theory is commonly known as the smoothing hypothesis (Watts and Zimmerman [1986]), to distinguish it from other hypotheses about accounting choice such as the debt hypothesis (Press and Weintrop [1990]) and the bonus hypothesis (Healy [1985]). A comprehensive review of papers published on income smoothing up to the end of the 1970s is found in Ronen and Sadan [1981]. While the emphasis of this chapter is a review of the income smoothing literature from the 1980s to the present, studies found in Ronen and Sadan that are relevant to the current study will also be discussed.

This chapter surveys both the theoretical and empirical literature on income smoothing, and on the effect of accounting discretion on the reporting decisions of managers and auditors. The most important studies surveyed in this chapter that are used to develop the hypotheses in Chapter 3 are Francis et al. [2003], Nelson et al. [2002a], Barton and Simko [2002], Sankar and Subramanyam [2001], Kirschenheiter and Melumad [2000], Barth et al. [1999], Demski [1998], Dye and Verrecchia [1995], Chaney and Lewis [1995], Lilien et al. [1988], and Ronen and Sadan [1981]. A number of the studies are not directly used for development of the hypotheses but are used in the discussion of the results (Chapters 6 and 8). The rest of the studies are included in the survey for completeness.

The remainder of the chapter is organised as follows. Section 2.2 examines different definitions of income smoothing. Section 2.3 surveys several instruments that managers use to smooth earnings. Sections 2.4 and 2.5 summarise the findings of theoretical and empirical studies on income smoothing. Section 2.6 reviews studies that examine accounting discretion and their effect on income smoothing.

2.2 DEFINITION OF INCOME SMOOTHING

One definition of income smoothing describes it as an attempt by managers to reduce the variability of earnings around its expected value (Ball & Watts [1972]). An earnings series is considered to be smooth when the deviation of actual earnings from expected earnings is small. The degree of smoothing by managers is usually measured by the extent of reduction of the variability in earnings as a result of the use of smoothing instruments (see Ronen and Sadan [1981] for a review). Since a manager's expectation of earnings is unobserved, expected earnings have been variously measured by the previous year's earnings, previous earnings with a drift term (Chaney et al. [1998]), and the analysts' expectation of firm's earnings (Degeorge et al. [1999], Moses [1987]). Others use a linear time trend model to obtain an estimate of expected earnings (Beidleman [1973], see also Ronen and Sadan [1981] for a review). The earnings trend generated from the regression is assumed to be the earnings managers expect to achieve over time.

There are also studies (Barth et al. [1999], Hunt et al. [1997]) that focus on the smoothness of the earnings series instead of the extent of smoothing by managers. The standard deviation of earnings is used to measure the smoothness of earnings (Barth et al. [1999], Hunt et al. [1997]). Francis et al. [2003] use a variation of this measure, which is

the ratio of the standard deviation of annual net earnings before extraordinary earnings to the standard deviation of annual cash flows from operations. By using such a ratio, Francis et al. are also measuring the extent of smoothing by managers. An assumption in these smoothness studies is that when an earnings series is smooth, it indicates that managers have smoothed earnings. However, Sunder [1997] points out that there is a subtle but important difference between the smoothness of an earnings series and smoothing by managers. It is possible that smoothing by managers may not result in a smooth earnings series if earnings follow a random walk (Ball & Watts [1972]) and managers focus on smoothing on a period by period basis. This arises because when managers attempt to bring current earnings closer to previous period's earnings, the random walk component in earnings will cause earnings in the future period to deviate even more from current period's managed earnings. Other situations that will lead to a difference between smoothing and smoothness include smoothing towards analysts' forecasts of earnings that fluctuate over time instead of following a trend.

A broader definition of income smoothing considers both the level and variability of earnings as targets of the smoothing process (Chaney and Lewis [1995], Koch [1981], Gonedes [1972], Gordon [1964]). Gordon [1964], for instance, argues that the objective of income smoothing is to influence the investor's view about the firm; therefore, if a smooth level of earnings with a steady change over time is used in the pricing of a firm, these two aspects of earnings should constitute the manager's smoothing objectives. In this broader smoothing definition, given that both the mean and variance are under the influence of the manager, a manager who successfully smoothes over time is likely to report earnings that show a smooth trend, i.e. smoothness.

Recent empirical evidence by Francis et al. [2003], Barth et al. [1999], Hunt et al. [1997] and DeAngelo et al. [1996] confirms Gordon's hypothesis that investors prefer firms with a high and steady change in earnings over time. Burgstahler and Dichev [1997] also provide several examples of firms which state that the goal of their firm is to consistently generate high earnings increases over time. Recent principal-agent research (Demski and Dye [1999], Meth [1996], Sung [1995]) further suggests that managers are able to control the mean and variance of earnings, and that optimal managerial contracts should include both elements in their design so as to ensure that managers would take actions that are consistent with the objectives of the principal. An experimental study by Koch [1981] also finds that a manager's attempt to reduce the variance of earnings may lead to a reduction in the level of earnings. When the sacrifice in the level of earnings is small, managers engage in more income smoothing. Moses [1987] reports findings similar to those in Koch [1981]. Moses finds that when managers smooth earnings, they consider the impact of their decision on both the risk and return of earnings.

2.3 SMOOTHING INSTRUMENTS

Both accounting techniques and real transactions are used in smoothing earnings (Ronen and Sadan [1981]). The accounting variables that are subjected to manipulation include depreciation, pension costs, extraordinary charges, and dividends from unconsolidated subsidiaries. In recent years, researchers have tended to focus on the effect of total accounting adjustments on earnings rather than the effect of individual accounting items (Subramanyam [1996], Dechow et al. [1995], Jones [1991]). Real variables such as advertising expenditures, research and development, and fixed assets

are also found to be manipulated by managers. Studies by Bartov [1993], Baber et al. [1991], Schramm and Sherman [1976], and Fisher and Hall [1969] provide evidence on the use of real variables in smoothing. Recent studies also examine the use of financial derivatives in smoothing earnings (Barton [2001], Hand [1989]).

2.4 THEORETICAL MODELS OF INCOME SMOOTHING

Theoretical models of income smoothing provide explanations as to why managers smooth earnings. Communication with shareholders is the most common explanation given in these studies (Demski [1998], Chaney and Lewis [1995], Trueman and Titman [1988], Ronen and Sadan [1981]). There are also models (Arya et al. [1998], Suh [1990], Lambert [1984]) that demonstrate that income smoothing benefits shareholders by providing them with a better contracting outcome with managers when income smoothing is allowed than when it is not allowed. Income smoothing can also be used to further a manager's own interests, such as the extension of the manager's employment tenure (Arya et al. [1998], Fudenberg and Tirole [1995], Dye [1988]), and the smoothing of compensation over time (Suh [1990]).

2.4.1 Provides information to shareholders

Managers possess knowledge about the firm which they would like to communicate with shareholders. Disclosure of information benefits firms because it ensures the correct pricing of the firms' shares in the capital markets. Generally, firms do not make direct disclosures of information because of the costs and legal constraints associated with this form of disclosure (Schipper [1989]). Instead, information is usually conveyed through

financial reports (Healy and Palepu [2001]). The studies surveyed in this section show that smooth earnings are used to convey the private knowledge of managers such as a manager's knowledge of future earnings (Demski [1998], Ronen and Sadan [1981]), and the quality of the manager (Chaney and Lewis [1995]). Given that the variability in earnings can increase the bankruptcy risk of a firm, Trueman and Titman [1988] suggest that smooth earnings can also be used to convey information about a firm's lack of bankruptcy risk.

2.4.1.1 Knowledge of future earnings

Ronen and Sadan [1981]

In Ronen and Sadan [1981], a manager's compensation is based on stock prices. Managers possess private information about future cash flows and the persistence of earnings, which is needed by shareholders to determine an appropriate price for the firm's shares. Managers are motivated to reveal this information to shareholders because any information that maximises stock prices will also maximise the managers' compensation. Ronen and Sadan [1981] show that managers signal their knowledge about future earnings by smoothing earnings.

Demski [1998]

Similar to Ronen and Sadan [1981], Demski [1998] also shows that managers use smooth earnings to convey their knowledge about future earnings. In Demski [1998], the principal wishes to design a contract that motivates managers to exert a high level of effort. The manager is compensated according to the earnings reported in each period.

Demski finds that the optimal contract is one that induces managers to smooth earnings. The reason is that the ability to smooth earnings is possible only when a manager has foresight or knowledge about future earnings. With foresight, managers are able to make appropriate transfers of earnings between the current and future periods in order to achieve their earnings objective in the current period. When current earnings are low but are expected to be high in the future, managers can transfer earnings from the future to the current period. A reverse action can be taken when current earnings are high and future earnings are expected to be low. Managers who lack foresight can also make these transfers in order to meet the current period's objective; however, they risk making future earnings worse especially if these earnings turn out to be low. Compared to managers with high foresight, low foresight managers will find it difficult to achieve their earnings objective in every period. Therefore the pattern of reported earnings reported by low foresight managers is likely to be less smooth than those reported by high foresight managers. Demski suggests that an examination of the smoothness of the time series of earnings is one way investors can learn about the knowledge possessed by managers.

An important argument in Demski [1998] is that the foresight that enables managers to smooth earnings can be acquired through the managers' diligence (or effort level). For instance, by expending effort on gathering information about customers and their potential demands, a manager will be in a better position to predict future earnings. Therefore when a smooth earnings stream is reported by the manager, it indicates to the principal that the manager has been diligent. However Demski also cautions that when managers are allowed to smooth earnings regardless of their effort level (such as when

there is accounting discretion), the reported earnings patterns may not provide any information to the principal.

2.4.1.2 Quality of manager

Chaney and Lewis [1995]

Similar to Demski [1998], Chaney and Lewis [1995] use the signalling argument (Spence [1973]) to explain income smoothing by managers. In their model, investors use reported earnings to update their prior probabilities about a firm's value because economic earnings are not observed. Managers can affect the information content of earnings report by changing the mean and variance of reported earnings relative to economic earnings. By choosing reporting parameters that are similar to those of a high quality manager, a low quality manager increases the probability that the firm will be assessed as a high quality firm. The action, however, reduces the information content of all earnings reports. High quality managers find this reduction in information content undesirable and seek ways to reduce the mimicking action of low quality managers.

Chaney and Lewis show that by reporting high and smooth earnings, high quality managers distinguish themselves from low quality managers. Over-reporting earnings is costly because higher earnings attract higher taxes, and this lowers a firm's value. Since a manager's compensation is tied to the firm's value, over-reporting also lowers the compensation for the manager. In equilibrium, high quality managers choose a level of over-reporting that low quality managers do not find attractive to mimic because of the lower compensation. At this equilibrium, a high quality manager also smoothes earnings towards its expected earnings level (i.e. reduce the variance of earning) in order to

improve investors' assessment of the firm's value. A perfectly smoothed reported earnings series results in a perfectly informative earnings signal because earnings become deterministic. A correct pricing of the high quality firm is therefore possible under these circumstances.

2.4.1.3 Bankruptcy risk of firm

Trueman and Titman [1988]

Trueman and Titman [1988] suggest that the smoothness of earnings affects a debt-holder's assessment of the probability of bankruptcy for a firm. When a firm's earnings are volatile, debt-holders perceive that the firm has a higher risk of bankruptcy. As a result, the cost of borrowing for the firm increases, and the cash flows available to shareholders are reduced. With smooth earnings, however, debt-holders are encouraged to revise upwards the probability that the firm has a low earnings variance. The model therefore predicts that smoothing earnings is an optimal strategy for managers. The advantages of smooth earnings are that the firm's cost of borrowing decreases and shareholders benefit from a higher firm value.

Trueman and Titman suggest that their model can be extended to situations where the mean earnings are not known to investors, or to situations where both the mean and variance are not known to investors. If the mean is not known, they predict that the manager will be motivated to increase reported earnings (e.g. prior to the sale of securities) regardless of whether the action results in a smoother earnings stream. The increase in reported earnings improves the investors' assessment of the mean of future economic earnings, and this would lead to an increase in the price at which securities are

sold. On the other hand, if both the mean and the variance are not known, the manager is predicted to increase and smooth reported earnings.

2.4.2 Improves contractual benefits for shareholders and managers

Managers have contracts with the firms they work for. Given that a manager's action is unobservable, Lambert [1984] shows that the optimal managerial contract that solves the moral hazard problem for shareholders results in income smoothing by managers. Shareholders are better off by allowing managers to smooth than when managers are not allowed to smooth. A study by Suh [1990] shows that when a manager's compensation is based on the earnings reported by managers in each period, the desire to have a steady compensation over time may lead managers to smooth earnings. Concern about the premature termination of these employment contracts can also lead managers to smooth earnings. Smoothing can ensure the continuation of a manager's current employment contract (Arya et al. [1998], Fudenberg and Tirole [1995]); it can also be used to ensure that contracts with future shareholders will not be adversely affected (Dye [1988]).

2.4.2.1 Solves moral hazard problem

Lambert [1984]

Lambert [1984] shows that income smoothing can result when a manager's actions are unobservable. In the two-period model, the compensation of a manager in each period depends on the cumulative earnings of the firm in the previous and current periods. Managers can affect earnings through real variables. Lambert shows that the optimum contract set by the principal naturally induces the manager to smooth earnings. He finds

that the manager's effort in the second period is a decreasing function of the earnings in the first period. When earnings are high in the first period, managers will lower their effort in the second period in order to achieve target earnings. Conversely, when earnings are low in the first period, managers increase their effort in the second period to compensate for the low earnings in the previous period.

Suh [1990]

Similar to Lambert [1984], this study shows how income smoothing can arise as a rational equilibrium behaviour in an agency setting. In contrast to Lambert [1984], this study examines income smoothing with accounting variables. In the two-period model, a manager's compensation is based on reported accounting earnings. The manager obtains private information on the firm's future productivity after the first period's production. By making appropriate accounting choices, the manager can achieve consumption smoothing by smoothing earnings. For instance, when the future productivity is unfavourable, the manager will choose straight line depreciation instead of accelerated depreciation. However, when the future is favourable, the manager will choose accelerated depreciation. Suh also shows that the delegation of accounting choices to managers to enable them to smooth earnings is an alternative Pareto-equilibrium mechanism to the direct communication of information on output.

2.4.2.2 Delays termination of contract

Fudenberg and Tirole [1995]

Fudenberg and Tirole [1995] show that managers smooth earnings because they are concerned that poor earnings may result in a termination of their contracts. The model has three features: (1) the manager acquires satisfaction from operating the profit centre, (2) the firm cannot provide the manager with a long-term contract, and (3) a recent earnings report is more informative about a manager's performance than less recent ones. When the dismissal decision is made in the second period of the manager's contract, the manager prefers to report low earnings in the first period in order to bring forward the most savings to second period. However, when dismissal is possible in the first period, managers strictly prefer to report a level of earnings that does not result in dismissal.

Arya et al. [1998]

Using an agency framework, Arya et al. [1998] show that earnings management is beneficial to both the manager and the owner of the firm. When earnings management is allowed, managers can delay the termination of their employment contracts by reporting high earnings when the true earnings is low. Since the owner of the firm only discovers the true earnings in the following period, the owner incurs a cost of retaining an unproductive manager for a longer period. However, compared to a situation in which earnings management is disallowed, the owner who allows earnings management does not need to pay as much to induce a manager to join the firm. In equilibrium, the benefits of allowing earnings management are found to exceed its cost to the owner.

2.4.2.3 Secures better future contracts

Dye [1988]

The income-smoothing model in Dye [1988] is based on the overlapping generations model in Samuelson [1958]. In Dye's model, the shareholders of a firm sell the firm to another generation of shareholders after two years of ownership. Earnings generated each period are assumed to be identically and independently distributed. Managers are paid according to the amount of earnings they declare each period. Existing shareholders cannot commit future shareholders to the same terms that are offered in the manager's current compensation contract. Managers engage in income smoothing in order to ensure that their earnings disclosure will not adversely affect their contracts with future shareholders.

2.5 EMPIRICAL STUDIES OF INCOME SMOOTHING

2.5.1 Summary of main findings from studies before 1980

A comprehensive review of income smoothing studies before 1980 is provided in Ronen and Sadan [1981]. These early studies focus on whether firms smooth income, the reasons for smoothing earnings, and the types of instruments used to smooth income. A smooth earnings stream is considered a desirable objective of firms because a low variability in earnings implies low risk (Lev [1975]) and a greater predictability in earnings (Beidleman [1973]). Nearly all studies document income smoothing by firms (Ronen and Sadan [1975], Dascher and Malcolm [1970]). Both real transactions and accounting techniques have also been used to smooth earnings (Beidleman [1973]).

Within accounting smoothing, both classificatory and inter-temporal accounting techniques have been employed (Ronen and Sadan [1981]).

Ronen and Sadan [1981] note that many of the income smoothing studies had weak methodologies. For instance, the trend model, which is commonly used to estimate pre-managed earnings, lacks theoretical justification. Most studies also investigate only a limited number of smoothing instruments, and do not distinguish earnings generated from economic factors from those that are due to earnings management.

Nearly all the empirical income smoothing studies are archival studies. The only known experimental study is by Koch [1981] who examines whether managers trade off the level of earnings against the variability of earnings when smoothing income. Using financial executives as subjects, he finds that when there is a lower trade-off between earnings level and earnings variability, managers engage in more income smoothing. He also finds that smoothing by accounting variables is more common than smoothing by real production variables, and more smoothing occurs when the firm has dispersed shareholdings.

2.5.2 Studies from 1980s to present

In the last 20 years, empirical studies on income smoothing have focused on three main areas: the effect of smooth income on the valuation of firms, the use of operating variables to affect earnings, and the effect of constraints on smoothing income. Despite the use of different representations for smooth earnings and firm value, a consistent finding in the asset valuation studies is that, *ceteris paribus*, firms that report smooth earnings have higher prices than firms which do not report smooth earnings. A recent

study by Francis et al. [2003] shows that the valuation of these patterns of earnings is affected by the quality of earnings, with higher quality earnings showing a higher valuation. While most of these studies (Barth et al. [1999], Chaney et al. [1998], Hunt et al. [1997], Subramanyam [1996]) attribute the positive valuation to a better generation of economic earnings, a recent study by Myers and Skinner [2002] find that patterns of increasing earnings reported by firms are the result of manipulation of accruals, special items, deferred charges and shares outstanding.

Although the types of instruments used to smooth income continue to be of interest to researchers (Burgstahler and Dichev [1997], Baber et al. [1991]), a few studies examine how managers employ different techniques in different situations in order to influence earnings or investors' perception of earnings. Hedging instruments and discretionary accruals are found to be substitutes in the smoothing of income (Barton [2001]). Beatty et al. [1995] examine how banks use different types of earnings management techniques to simultaneously satisfy tax, regulatory and earnings objectives. Kasznik [1999] finds that revision of forecasts, rather than the management of earnings, is sometimes used to reduce the difference between earnings forecast and reported earnings. Lilien et al. [1988] find that the type of accounting adjustments depends on the success of the firm: successful firms make less income-increasing accounting adjustments than unsuccessful firms.

Two studies examine the constraints managers face in smoothing earnings: they include the extent of previous overstatements of net assets (Barton and Simko [2002]), and the quality of auditors (Becker et al. [1998]). Barton and Simko [2002] document that firms that have previously overstated their earnings find it difficult to overstate future

earnings because of the reversals of previous periods' adjustments. Becker et al. [1998] show that low quality auditors are associated with more earnings management.

The following sections provide a summary of these recent empirical papers organised according to the three areas of study identified earlier: (1) valuation of shares, (2) instruments for smoothing, and (3) constraints to smoothing.

2.5.2.1 Valuation of shares

Subramanyam [1996]

Subramanyam [1996] finds that discretionary accruals convey information about economic earnings and are valued positively by investors. The discretionary component of earnings is positively associated with future operating cash flows, non-discretionary income, and net income, and changes in current and future dividends. He also finds evidence of pervasive income smoothing among firms, with managers using discretion to communicate private information to shareholders. He concludes that discretion in GAAP improves the quality of financial reporting. However, he cautions that measurement error in the discretionary accruals proxy remains a plausible alternative explanation of the results.

Barth et al. [1999]

Barth et al. [1999] find that investors place a higher valuation on firms that show patterns of increasing earnings than on firms that show an erratic growth in earnings, after controlling for the financial risk, operating risk and growth of the firm. They find that earnings multiples increase almost monotonically with the length of the earnings

pattern. Firms that are unable to maintain the smooth pattern of earnings experience a lower valuation. The study also shows that few firms are able to achieve consistently smooth and increasing earnings over time.

Chaney et al. [1998]

Two hypotheses are tested in this study: (1) when current earnings before discretionary accruals are higher than the previous year's reported earnings, current discretionary accruals will be negative; (2) firms that smooth earnings have higher earnings response coefficients than firms that do not smooth reported earnings. The model of Jones [1991] is used to compute the discretionary accruals. The analysis shows that both hypotheses are supported. In any given year, approximately 85% of the firms in their sample report discretionary accruals that are consistent with the prediction in hypothesis (1). The earnings response coefficient is also found to be higher for firms that constantly engage in income smoothing than for firms that do not smooth.

The analysis is repeated for different measures of expected earnings, namely, 115% of the prior year's reported earnings, and previous year's earnings plus an additional amount based on the average of the two prior year's unexpected earnings. Similar results are obtained.

Hunt et al. [1997]

The study shows that firms with lower earnings volatility are associated with a higher market value for equity. When pricing earnings, investors distinguish between earnings smoothness arising from non-discretionary and discretionary accruals. Discretionary

earnings smoothing has a larger positive impact on equity value than earnings smoothing arising from non-discretionary accruals. Smoothing is also used to signal information about future cash flows, and, to a lesser extent, about the future risk of the firm. The authors conclude that their results are consistent with the information hypothesis in which managers smooth earnings to communicate private information to shareholders, but are not consistent with the opportunistic hypothesis in which managers attempt to use the firm's resources for their own benefit.

Myers and Skinner [2002]

Myers and Skinner investigate whether managers use earnings management to achieve increases in quarterly earnings per share over time. Consistent with the results in Barth et al. [1999], they find that firms with consistent earnings increases over time have higher valuations than firms without such earnings patterns. In contrast to Barth et al. [1999], the authors attribute the pattern of increasing earnings to earnings management instead of the stability of cash flows of the firms. Managers of firms in their sample are found to manage accruals, selectively report special items such as disposals of assets, time stock repurchase, and manage deferred tax charges to achieve earnings increases over time. These managers have incentives to improve earnings because they own more shares in their firms and have more unexercised stock options than managers of firms that do not demonstrate such an earnings pattern.

Francis et al. [2003]

Several studies (e.g. Francis et al. [2003], Barth et al. [1999], and Hunt et al. [1997]) show that some patterns of earnings are associated with higher stock prices. This study investigates three patterns of earnings (smooth earnings, increasing earnings and earnings that meet analysts' forecast) to determine whether their pricing captures the same or different aspects about the firm. The study finds that the patterns are related to each other but they are not substitutes. Earnings quality is also found to affect the pricing of earnings patterns. Earnings quality is measured by the amount of accruals in earnings that are not the result of a firm's operations. A low level of such accruals implies high earnings quality, while a high level indicates low earnings quality. This measure therefore provides an estimate of the extent of earnings manipulation by managers. The study finds that higher quality earnings combined with any of three patterns results in a higher valuation for the firm than does lower quality earnings.

2.5.2.2 Instruments for smoothing earnings

Baber et al. [1991]

The study focuses on how investment decisions are used to achieve income objectives. It investigates whether a manager's concern about current earnings affects his decision to invest in research and development (R&D). The results show that managers reduce their R&D investment in order to report positive earnings or to show an increase in earnings in the period. Firms which are not constrained by their earnings have relatively higher R&D expenditures. The difference in R&D investments between these two types of firms is not

due to differences in investment opportunities or the presence of income-based compensation plans.

Burgstahler and Dichev [1997]

By analysing the cross-sectional distributions of earnings and changes in earnings, Burgstahler and Dichev find that 8-12% of firms with small pre-managed earnings decreases manipulate earnings to achieve earnings increases, and 30-40% of firms with small pre-managed losses manage earnings to create positive earnings. They conclude that firms manage reported earnings to avoid earnings decreases and losses, which is consistent with prospect theory (Tversky and Kahneman [1991]). Two components of earnings, cash flow from operations and changes in working capital, are frequently used to increase earnings. They also find that firms with the highest pre-managed cash flow from operations are more likely to manipulate earnings through increases in cash flow from operations than are firms with lower levels of cash flows. The incentives for avoiding earnings decreases are greater when the firm has a history of earnings increases.

Barton [2001]

The study investigates whether managers use derivatives and discretionary accruals as partial substitutes in smoothing earnings. Derivatives reduce the volatility of earnings through their effect on the cash flows of firms, while accruals affect the volatility of earnings directly. Substitution between the two techniques can arise when one technique is more costly, less effective or less efficient than the other in smoothing earnings. A manager's incentive for maintaining a desired level of earnings volatility can arise from

the need to increase managerial compensation, to reduce taxes and borrowing costs, and to avoid earnings surprises. The author finds that after controlling for these incentives, the amount of derivatives used by a firm is negatively related to the magnitude of discretionary accruals. These results suggest that firms with high cash flow volatility manage accruals to a larger extent than firms with low cash flow volatility. The author concludes that accrual and cash flow management are interrelated. He also cautions that the more comprehensive disclosure of derivative positions held by firms, required by the Statement of Financial Accounting Standards No. 133, Accounting for Derivative Instruments and Hedging Activities (FASB 1998), may lead to less hedging and more accrual management because hedging would become a more costly option for managers.

Beatty et al. [1995]

Beatty et al. [1995] examine how banks use different types of earnings management techniques to simultaneously satisfy tax, regulatory and earnings objectives. The techniques include adjustments of accruals, sales of investments and issuance of securities. They find that the use of financing or accruals (e.g. loan loss provisions, and loan charge-offs) to satisfy capital adequacy requirements is jointly determined. Bank managers also make selective sales of investment assets to meet earnings targets, and the recognition of gains on these investments has an effect on a manager's decision as to how much to accrue for loan losses and how much to finance with securities.

Kasznik [1997]

The study investigates whether managers who issue annual earnings forecasts manage reported earnings towards their forecasts in order to avoid litigation by investors and the loss of reputation. The analysis shows that when actual pre-managed earnings are below the manager's earnings forecast, discretionary accruals are decreased to reduce forecast errors. These managers are also more likely to postpone real expenditures such as advertising to reduce forecast errors than are managers whose earnings forecast is underestimated. The availability of accounting flexibility, which is measured by the change in total accruals in the year prior to the forecast year, encourages the manager to make greater reductions in the forecast errors through discretionary accruals. When actual pre-managed earnings exceed the earnings forecast, managers prefer the upward revision of earnings forecasts rather than an increase of discretionary accruals in order to minimise forecast errors. Accounting flexibility therefore does not have an impact in this situation.

Lilien et al. [1988]

Lilien et al. examine the accounting changes made by successful and unsuccessful firms, matched by industry, during the 1974-1983 period. The success of the firm is measured by the firm's ten-year total market return to shareholders, with high market returns indicating success and low market returns indicating a lack of success. Total market return comprises the capital gains and dividends of the firm's share. They find that unsuccessful firms make more accounting changes that increase income than do successful firms. The income effect of the accounting change is also greater for the

333unsuccessful firms. Lilien et al. suggest that successful firms do not have similar motivations to improve income because they are more likely to meet target income from their normal operations. Further, from an income smoothing perspective, successful firms would like to maintain a steady growth of income over time instead of high growth in income which they may find difficult to maintain over time.

2.5.2.3 Constraints to income smoothing

Barton and Simko [2002]

The study investigates whether the objectivity and conservatism principles in GAAP constrain managers of firms with overstated net assets from repeatedly overstating future earnings. The amount of discretion available to managers in the current period is a function of their previous accounting choices. Firms that have previously overstated their earnings will find it more difficult to overstate future earnings because the adjustments in previous periods reverse in the future. These firms are therefore more likely to miss their earnings forecasts. The study provides evidence on the constraints imposed by previous overstatements of net assets.

Becker et al. [1998]

The relationship between audit quality and earnings management is investigated in this study. Big Six auditors are assumed to be more proficient in their audit services than other auditors. Becker et al. find that firms that are audited by non-Big Six auditors have higher discretionary accruals than firms audited by Big-Six auditors. The difference between the two groups of firms averages 1.5-2.1 percent of total assets. The mean and

median of the absolute value of discretionary accruals are also greater for firms with non-Big Six auditors. The authors conclude that lower audit quality is associated with more earnings management.

2.6 STUDIES ON ACCOUNTING DISCRETION

Auditors attest to the accuracy of financial statements prepared by managers. Consequently, the amount of accounting discretion that managers have in reporting the financial performance of a firm is dependent not only on the choices available in accounting standards, but also on the auditors' interpretation of standards (Amer et al. [1994]) and the auditors' incentives regarding the audit task (Hackenbrack and Nelson [1996]). This section focuses on studies that examine how accounting discretion affects the reporting decisions of managers and auditors.

Two theoretical studies by Dye and Verrecchia [1995] and Sankar and Subramanyam [2001] investigate the effect of reducing accounting discretion on income smoothing by managers. In addition, Kirschenheiter and Melumad [2000] and Kirschenheiter and Melumad [2002] show that the availability of discretion enables managers to communicate their knowledge about cash flows or the components of earnings to shareholders.

There are a few archival studies (Elliott et al. [1984], Horwitz and Kolodny [1980], Dukes et al. [1980]) that examine whether managers alter their operational decisions in response to the elimination of discretion in accounting standards. A number of studies use experiments to examine how discretion in accounting standards affects auditors' judgement. However, there are no known experimental studies on how accounting

discretion affects managerial decision making. This is probably due to the lack of easy access to corporate managers. A recent study by Nelson et al. [2002a] uses a survey of auditors to investigate the responses of auditors to earnings management attempts by managers, and finds that the precision of standards affects auditors' decisions.

2.6.1 Effect of uniform versus discretionary GAAP on income smoothing

Dye and Verrecchia [1995]

This paper examines the impact of discretionary versus uniform GAAP on a manager's ability to communicate information about the firm's true earnings in a one-period model. Dye and Verrecchia [1995] show that if the manager's contract can be observed publicly, and gross (true) earnings is measured without error, discretionary GAAP are welfare-enhancing. Discretionary GAAP make it easier to contract with a manager because they increase the number of dimensions over which the manager's performance can be judged. In addition, discretionary GAAP allow managers to communicate information about the true economic earnings to shareholders. When this happens, current shareholders benefit from a higher selling price for the firm.

Sankar and Subramanyam [2001]

Sankar and Subramanyam [2001] extend Dye and Verrecchia [1995] by introducing a two-period model in which the manager has private information about earnings in the second period. They find that the market responds more to earnings reported under a restricted discretion regime than under a no discretion regime. Given that discretionary accruals reverse over time, the model uses the level of reversals of discretionary accruals

to represent a manager's available discretion. A manager has limited discretion when there is a high level of reversal of discretionary accruals. In contrast, when there is a low level of reversal, the manager has a high level of discretion. The authors find that there is a minimum threshold of reversal such that when the reversal is higher than the threshold, the manager will smooth income to reflect his private information about the second period's earnings. Otherwise, the manager would over-report earnings in first period such that earnings become uninformative.

Kirschenheiter and Melumad [2000]

In this study, investors use reported earnings to deduce information about a firm's level of permanent cash flows and quality of earnings. A high level of reported earnings is associated with a high level of expected permanent cash flows, while reported earnings that are close to an investor's expectation of earnings are of higher quality. Firms with both these reported earnings characteristics have a higher valuation than firms without such earnings.

The main result from this study is that when reporting discretion is allowed, the optimal strategies of managers, whose objective is to maximise a firm's value, depend on the level of cash flows observed during the period. When cash flows are very low, the optimal strategy is to under-report earnings by making significant amounts of charges against earnings for the period (i.e. big bath). The amount of under-reporting depends on the level of discretion available to the manager. At other levels of cash flows, the optimal strategy for managers is to smooth earnings. Kirschenheiter and Melumad also find that the level of sophistication of investors and the type of pricing rule used by investors to

translate reported earnings to stock prices do not significantly affect the optimal strategies adopted by managers.

Kirschenheiter and Melumad [2002]

Kirschenheiter and Melumad [2000] examine the effect of discretion on the reporting strategies of managers when managers have knowledge about the level of cash flows only. This study extends Kirschenheiter and Melumad [2000] by investigating whether discretion in reporting leads to an improvement in the quality of reported earnings when a manager has knowledge of the transitory and permanent components of earnings. High quality earnings are defined as earnings that show a low deviation from the long run earnings of the firm. In the model the manager has either a partial or complete knowledge of the components of earnings. A partially informed manager (also known as a better informed manager in the study) only has information about the components of earnings in the first period, while a completely informed manager knows the components of earnings in both the first and second periods.

The results show that when managers are better informed, they use discretion to affect the information content of reported earnings by smoothing. When the transitory portion of earnings in the current period is large enough to ensure positive earnings in the current and the next period (i.e. good news), the manager smoothes earnings over both periods. This action leads to an improvement in earnings quality. In contrast, when the transitory portion is insufficient to ensure positive earnings in each period (i.e. bad news), the manager over-reports earnings when the transitory component is above permanent earnings and under-reports earnings when the transitory component is below permanent

earnings. As a result, the quality of earnings declines. When managers are completely informed, giving managers discretion does not improve the quality of earnings. Since investors are aware that managers have complete information, they would design contracts to motivate managers to reveal information truthfully. Therefore the disclosure strategy is the same as that under a no-discretion regime.

2.6.2 Effect of discretion in accounting standards on auditors' judgement

Nelson et al. [2002a]

Nelson et al. [2002a] document a dependence between the precision of accounting standards and the type of earnings management techniques. In their survey of auditors, earnings management attempts fall into two categories: structured and unstructured. Structured attempts are defined to include contract modification, and the manipulation of operations. Unstructured attempts refer to the manipulation of accounting estimation. Nelson et al. find that an auditor's acceptance of a manager's earnings management attempt depends on how the attempt is structured with respect to the precision of the affected GAAP. When accounting standards are precise, auditors generally accept actions by managers to structure transactions in a way that avoids an infringement of accounting rules. However, when accounting standards are less precise, auditors prefer managers not to structure transactions. Accordingly, Nelson et al. find that there are more instances of structured earnings management attempts when standards are precise than when they are imprecise. They also find that 60% of the earnings management attempts are income increasing. Auditors tend to agree to earnings management attempts when standards are imprecise, or when they decrease earnings.

2.6.3 Effect of mandatory changes in standards on managers

Horwitz and Kolodny [1980]

In 1975, the Financial Accounting Standards Board and the Stock Exchange Commission required all research and development expenditures to be treated as expenses in the year they are incurred. The study surveys chief financial officers of firms listed in the Over-The-Counter market to examine whether the enactment of this standard led to a decline in the amount of R&D expenditures incurred by firms. The authors find that small technology firms that previously use the capitalisation method for R&D reduced their R&D expenditures after the new standard was implemented.

Dukes et al. [1980] and Elliott et al. [1984]

In contrast to the results of Horwitz and Kolodny [1980], firms in Dukes et al. [1980] do not make changes to their R&D expenditures after the introduction of the mandatory accounting treatment. A subsequent study by Elliott et al. [1984] finds that the difference in results between Horwitz and Kolodny [1980] and Dukes et al. [1980] is due to the size differences of the firms in both samples, and the adoption of different methods to analyse the data. By increasing the sample size and applying a consistent methodology, Elliot et. al conclude that a reduction in R&D is associated with the new R&D standard. However, the authors are unable to account for why a number of firms switched to the expensing method before the standard became compulsory.

2.7 SUMMARY OF MAIN FINDINGS IN THE LITERATURE REVIEW

One of the main findings is that managers use income smoothing to communicate with shareholders. Income smoothing is also used to achieve a manager's personal objectives such as extensions to employment contracts, and smoothing of compensation. A second finding is that patterns of smooth increasing earnings are generally valued highly by investors. Smooth earnings appear to convey important information about the firm that investors find valuable when making their investment decisions. However, investors are concerned about the extent of manipulation of earnings with accounting adjustments in order to achieve smooth earnings. These two findings indicate that the availability of discretion may affect the information content of earnings patterns.

The third finding is that the ability of managers to smooth earnings is affected by the interaction between the manager's foresight and the availability of accounting discretion. Several studies indicate that foresight allows managers to make appropriate inter-period transfers of earnings. However, managers with limited foresight can also smooth earnings when accounting discretion is available to them. A few theoretical studies suggest that accounting discretion should be restricted in order to prevent managers who lack foresight from mimicking the smooth earnings patterns produced by managers with foresight. This action is expected to improve the quality of financial reporting.

The fourth finding is that managers may resort to other means of managing earnings (e.g. operational instruments or manipulation of evidence) when the manipulation of accounting variables is restricted. However, the directional effect of a restriction in accounting discretion on a manager's choice of smoothing instruments has not been explored.

3 HYPOTHESIS DEVELOPMENT

3.1 INTRODUCTION

Firms compete in the capital markets for resources. Managers of firms with high future earnings want to communicate their firm's superior prospects to investors so that scarce resources will be channelled to their firms instead of other firms. One method of communicating with investors is to make direct disclosures of private information. Most managers, however, find it difficult to use this form of communication in view of proprietary costs, and institutional and legal constraints relating to the direct disclosure of information (Schipper [1989]). Consequently, managers prefer to use financial reports to communicate with investors (Healy and Palepu [2001]). Financial reporting provides a credible means of communication with investors because of the presence of accounting standards, which ensures consistent treatment of transactions and events in the financial statements, and the enforcement of these standards by auditors.

One way in which managers can utilise financial reporting to communicate their knowledge of a firm's superior prospects is by reporting smooth increasing earnings over time (Kirschenheiter and Melumad [2002], Burgstahler and Dichev [1997], and Chaney and Lewis [1995]). Recent studies by Francis et al. [2003] and Barth et al. [1999] provide evidence that capital markets value this form of communication: firms that report smooth increasing earnings over time have higher valuation than firms that do not report such earnings. However, reports of smooth increasing earnings indicate that the managers have private knowledge to communicate to shareholders. Some managers may place their

personal interest above that of shareholders (Healy and Wahlen [1999]). These managers manage earnings to show a smooth increasing trend in order to secure benefits for themselves (e.g. higher compensation) even though by reporting such earnings they are misrepresenting the worth of the firm to investors (Myers and Skinner [2002]). Investors are therefore faced with the challenge of using smooth earnings patterns to distinguish between managers who have information to communicate from those who do not.

3.2 HYPOTHESES ON REPORTING OF SMOOTH INCREASING EARNINGS

Demski [1998] and Kirschenheiter and Melumad [2000] suggest that there is a relationship between a manager's knowledge about future earnings and his/her ability to report smooth earnings. Only managers with foresight are able to smooth earnings properly because the knowledge enables them to make appropriate inter-period transfers of earnings. Demski further suggests that the knowledge of future earnings can be acquired through a manager's diligence. For instance, when managers expend effort to gather more information about operations and customers' demands, they are in a better position to predict future earnings. A less diligent manager does not acquire the foresight to smooth earnings properly. Consequently, Demski argues that patterns of smooth earnings reported by managers reveal information about a manager's foresight.

Following Demski's argument, high foresight managers who possess private information about future earnings will find it easier to smooth earnings than low foresight managers. The availability of high levels of accounting discretion, however, may compensate for a manager's lack of foresight, and may make it possible for low foresight managers to report earnings patterns that are similar to those of high foresight managers

(Sankar and Subramanyam [2001], Demski [1998], Dye and Verrecchia [1995]). Accounting discretion enables low foresight managers to shift earnings between periods. However, since they have limited knowledge of future earnings, their transfers of earnings will be based on their assessment of current earnings. When current earnings are high, a manager can increase accounting provisions for the current period in order to transfer some earnings to future periods. The reverse happens when current earnings are low. When both high and low foresight managers are able to report smooth increasing earnings, investors cannot rely on earnings patterns produced by firms to infer managerial types. Demski [1998] and Sankar and Subramanyam [2001] suggest that an environment of limited accounting flexibility is important in ensuring that earnings reports can be used to distinguish between high and low foresight managers. The first hypothesis (in alternative form) is:

H1: A reduction in accounting discretion brings about a separation in the earnings series reported by high and low foresight managers.

For a reduction in accounting discretion to be an effective separating mechanism, it has to prevent the smoothing of earnings by low foresight managers and at the same time allow high foresight managers to continue reporting smooth increasing earnings. Healy and Wahlen [1999] argue that managers need accounting discretion in order to report earnings that reflect economic earnings. A reduction in accounting discretion is therefore predicted to affect the reporting ability of high foresight managers negatively because managers cannot make accounting choices appropriate to their businesses. Kirschenheiter and Melumad [2000], Kirschenheiter and Melumad [2002], Dye and Verrecchia [1995]

provide similar theoretical arguments. Kirschenheiter and Melumad [2002], for instance, argue that accounting discretion enables managers to smooth earnings over time in order to reveal the permanent component of earnings to investors.

An assumption in Kirschenheiter and Melumad [2002], Healy and Wahlen [1999], and Dye and Verrecchia [1995] is that managers rely only on accounting discretion in order to achieve their earnings target. However, several studies show that managers use both operational and accounting techniques for earnings management (Nelson et al. [2002a], and Ronen and Sadan [1981] for a review). Therefore, a reduction in accounting discretion may not affect a manager's ability to report smooth increasing earnings when alternative smoothing techniques are available.

Recent studies show that managers view accounting adjustments and operational variables as substitutes when managing earnings (Barton [2001], Beatty et al. [1995]), and that the use of operational variables in earnings management is related to the discretion available in accounting standards (Nelson et al. [2002a]). The results in Nelson et al. [2002a], Barton [2001], and Beatty et al. [1995] suggest that managers may alter their operational strategies in response to the level of accounting discretion in order to achieve their reporting objective. When accounting discretion is reduced, managers are likely to make less investments in assets with variable returns (e.g. R&D), and more in assets with stable returns in order to reduce their need for accounting adjustments. In contrast, when a high level of accounting discretion is available, managers may be more risk-seeking in their investment decisions because they can offset any operational variability with accounting adjustments.

The use of operational variables in earnings management, however, requires a knowledge about a firm's operations and an understanding of future earnings. Nelson et al. [2002a] note that auditors and experts are sometimes used to assist managers in this form of earnings management. In the experiment, managers with high foresight understand their operations better than low foresight managers, and this provides the former with a greater capacity to use operational variables for smoothing earnings (Demski [1998]). When accounting discretion is reduced, high foresight managers are likely to organise their investments in a way that reduces their exposure to the variability in earnings. Therefore a reduction in accounting discretion will not affect their ability to report smooth increasing earnings over time. In contrast, low foresight managers lack the foresight to utilise operational variables effectively. These managers are likely to rely only on accounting discretion to achieve their earnings target because they have less control over the variability of operating earnings (Barth et al. [1999]). A decline in accounting discretion is therefore expected to affect them significantly (Sankar and Subramanyam [2001], Demski [1998]). The second and third hypotheses (in alternative form) are:

H2: A reduction in accounting discretion motivates high foresight managers to reduce investments in assets with variable returns, and to increase investments in assets with less variable returns in order to report smooth increasing earnings. Low foresight managers are less able to make these operational adjustments.

H3: A reduction in accounting discretion has a smaller effect on a high foresight manager's ability to report smooth increasing earnings than on a low foresight manager.

An alternative explanation as to why a reduction in accounting discretion may affect high foresight managers differently from low foresight managers is that the former may not rely on accounting variables when operational techniques are available in a low discretion environment. When this happens, a reduction in accounting discretion does not diminish a high foresight manager's ability to report smooth increasing earnings. Lilien et al. [1988] show that unsuccessful firms make more accounting adjustments that increase earnings than do successful firms. Lilien et al. suggest that successful firms do not have to rely on accounting changes because they are more likely to meet target earnings through normal operations. Demski [1998] also argues that a manager's understanding of the firm's operations enables the manager to combine firm's inputs in such a way that achieves smooth earnings. Reliance on accounting adjustments is therefore expected to be minimal for these managers. In contrast, managers who have a poor understanding of their operations would have to rely more on accounting adjustments. Accordingly, high foresight managers in the experiment are predicted to use fewer accounting adjustments for reporting smooth increasing earnings than low foresight managers when accounting discretion is reduced. The fourth hypothesis (in alternative form) is:

H4: High foresight managers use fewer accounting adjustments than low foresight managers to achieve their reporting objective in a low discretion environment.

3.3 HYPOTHESIS ON SMOOTHING DURATION

The hypothesis in this section focuses on whether the smoothing duration interacts with foresight and discretion to affect the ability of managers to report smooth increasing earnings. Smoothing duration refers to the number of financial periods over which

managers are required to report smooth increasing earnings. A smoothing duration of 5, for instance, refers to reporting of smooth increasing earnings over five financial periods.

Barth et al. [1999] report that firms which show increasing earnings over time also have lower earnings variability than other firms. However, not many firms are able to consistently report increasing earnings over time. Over the period 1982-1992, Barth et al. find that the number of firms that show a continuous increase in earnings for 8 years is approximately 8 times less than firms that show continuous earnings increases for 4 years. Myers and Skinner [2002] investigate how managers are able to achieve increases in quarterly earnings per share over time. They find that managers of firms in their sample achieve their earnings target by managing accruals, timing stock repurchase, managing deferred tax charges, and selectively reporting special items such as disposals of assets. One implication of Myers and Skinner's study is that the availability of accounting discretion facilitates a manager's ability to report smooth increasing earnings over time.

Hunt et al. [1997] suggest that the ability to generate a smooth earnings stream over time is also dependent on the quality of the firm. The quality of the firm is measured by the expected value of future earnings: a higher expected value implies a higher quality firm. Hunt et al. argue that low quality firms are unable to smooth over long periods because they face greater costs of smoothing than high quality firms. Hunt et al. recommend that investors evaluate the smoothness of a firm's earnings over a longer period in order to obtain more accurate inferences about the firm's quality. Hunt et al., however, do not elaborate on how the greater cost of smoothing can arise for low quality managers. A recent study by Barton and Simko [2002] provides insight into the cost of

smoothing experienced by managers. Barton and Simko report that firms that have previously overstated earnings experience greater costs of smoothing in future periods. The reversal of previous accounting adjustments requires managers to make more income-increasing accounting adjustments in the future in order to maintain the same level of earnings.

Low foresight managers in the experiment are likely to rely on accounting adjustments to smooth earnings over time because their lack of foresight makes it more difficult to use operational smoothing. An implication of Barton and Simko's results is that as the smoothing duration increases, the low foresight manager has to cope with an increasing amount of accounting reversals. Therefore the availability of accounting discretion in each period becomes important to low foresight managers if they want to report smooth increasing earnings over many periods. A high amount of accounting discretion enables these managers to better cope with the reversing accounting adjustments over time. Demski [1998] predicts that low foresight managers would be able to report an earnings stream that is indistinguishable from that of high foresight managers when they are given discretion. A reduction in accounting discretion therefore makes it difficult for low foresight managers to cope with the reversals of accounting adjustments over time, and hence reduces their ability to report smooth earnings over long periods. High foresight managers, in contrast, are less likely to be affected by reversing adjustments when smoothing over longer periods because they are in a better position to rely on both investments and accounting adjustments to cope with these reversals. Although high foresight managers may still be affected by a reduction in accounting discretion, their

ability to maintain increasing and smooth earnings over time is likely to be higher than low foresight managers.

Based on these arguments, the last hypothesis predicts that there is a three-way interaction between smoothing duration, foresight and discretion. Specifically, the last hypothesis (in alternative form) states that:

H5: Compared to high foresight managers, low foresight managers find it more difficult to smooth earnings over a longer duration in a low accounting discretion environment than in a high or moderate discretion environment.

4 EXPERIMENTAL DESIGN AND METHOD

4.1 INTRODUCTION

The experiment was implemented with a computer program, *Prospero*, which was developed by the author. The program runs on the Windows platform on IBM-type personal computers. Participants use the program to enter their operating and accounting decisions. The theoretical basis for the experimental design and algorithms implemented in *Prospero* are discussed in Section 4.2. An overview of how the user interacts with the two main decision dialog boxes, *Investment* and *Accounting*, and a description of all the dialog boxes available in *Prospero* are provided in Section 4.3. The last section, Section 4.4, describes the experimental method.

4.2 THEORETICAL BACKGROUND FOR EXPERIMENT

4.2.1 Definition of Income Smoothing

As discussed in Chapter 2, two definitions of income smoothing are found in the literature. The first definition of income smoothing (e.g., Schipper and Vincent [2003], Ball and Watts [1972]) describes income smoothing as an attempt to reduce the variability of earnings around an exogenous ex-ante level of earnings (e.g., analysts' forecasts or previous year's earnings). The level of earnings is not considered part of the smoothing process. Studies that examine whether managers smooth towards a target level of earnings or the smoothness of earnings generally adopt this definition (DeFond and Park [1997]). The second definition of income smoothing, as given in Chaney and Lewis

[1995], Trueman and Titman [1988], and Gonedes [1972] considers the management of both the level of earnings and its variance as part of the income smoothing process. The level and variance of earnings provide investors with different information about a firm's ability to generate earnings: a high level of earnings indicates that the firm has a high level of permanent cash flows, while a low variation in earnings indicates that the firm has high quality earnings (Kirschenheiter and Melumad [2002]). The importance of reporting smooth increasing earnings is also recognised by firms: Burgstahler and Dichev [1997] provide examples of several firms whose goal is to consistently generate increasing earnings over time.

The second definition of income smoothing is adopted in this thesis in view of evidence, discussed in Chapter 2, which suggests that this definition better describes the smoothing actions of managers. It also better captures the importance of both the level and variance of earnings to investors. The experiment in this thesis therefore requires participants to report smooth increasing earnings over time. The participants have to manage both the mean and variance of the change in earnings over time in order to achieve their objective.

4.2.2 Operating Decisions and Foresight

In the experiment, the participants can use both operating and accounting variables to achieve their objective. The operational variables available to participants are equipment, R&D and advertising. All three types of assets have been used by managers to manage earnings (Nelson et al. [2002b], Bushee [1998], Bartov [1993], Dechow and Sloan [1991], Lev [1975], Beidleman [1973]).

Operating decisions are made at the beginning of the period. An algorithm, adapted from empirical results reported by Lev and Sougiannis [1996], translates these decisions into operating revenue. The use of an actual empirical relationship provides realism to the experiment, and increases the external validity of the experiment. The algorithm is given in equation 4.1.

$$OR_{it} = (1 + e_{it}) * (0.155TA_{it-1} + 0.224RD_{i,t-1} + 0.347RD_{i,t-2} + 0.386RD_{i,t-3} + 0.360RD_{i,t-4} + 0.288RD_{i,t-5} + 0.363RD_{i,t-6} + 1.055AD_{i,t-1}) \quad (4.1)$$

where OR_{it} refers to firm i's operating revenue from investments net of all expenses except for depreciation, advertising and R&D in period t. TA_{it-1} refers to total stock of equipment for firm i at the beginning of the period (t-1). RD_{it-1}, and AD_{it-1} refer to R&D expenditures and advertising expenditures, respectively, for firm i at the beginning of the period (t-1). RD_{it-2} to RD_{it-6} refer to R&D expenditures made one (t-2) to five (t-6) periods ago respectively. When the random term (e_{it}) is excluded, equation 4.1 provides the expected operating revenue for the period. When the random term is included, the equation provides the actual operating revenue for the period. The random term is normally distributed with a mean of 0% and a standard deviation of 5%. Given that the level of operating revenue may differ significantly among managers, the use of a percentage is preferred to the use of a dollar value for the random term. This ensures that the random term has a consistent meaning to the manager, regardless of the level of operating revenue he generates. To illustrate, assume that the random term is given in terms of a dollar amount such as $1000. Further assume that the manager expects an operating revenue before random term of $1 million. The addition of the random term has little effect on this manager. However, if in period two, the manager has operating

revenue before random term of $1000, the same random term will have a large effect on his performance. Therefore even though the same random amount of $1000 is used in both cases, its effect on the manager's performance is significantly different. The use of a percentage for the random error would overcome this problem.

The assets in equation 4.1 show differing amounts and lengths of benefits. An investment in equipment generates long term and stable earnings. Given that the returns for equipment are computed based on total equipment stock available at the beginning of each period, an investment in $1 in equipment in period 1, for instance, will provide $0.155 in every period thereafter. This is because the $1 investment will be carried forward to future periods as part of the firm's total equipment stock. An investment in R&D generates medium term benefits, while advertising generates short term benefits. The different coefficients on RD_{it} indicate that R&D generates more variability in earnings than either equipment or advertising.

Foresight is manipulated by providing high foresight participants with equation 4.1, and a decision aid that reveals the forecast of future earnings based on their current and previous operating decisions. The forecast of future earnings is computed from equation 4.1 with the error term excluded. Low foresight participants are not given equation 4.1. They are also not given the decision aid that forecasts future earnings. They are told that the three assets, R&D, equipment and advertising, provide differing returns and have differing periods of benefits.

4.2.3 Accounting Decisions and Accounting Discretion

Accounting decisions, which relate to adjustments to accounting provisions, are made at the end of the period after actual operating earnings from operating decisions are known. Participants are assigned different levels of accounting discretion for adjusting provisions.

The level of accounting discretion available to managers depends on the precision of rules in accounting standards and the intervention by auditors in the financial reporting process (Nelson et al. [2002a], Antle and Nalebuff [1991]). Auditors tend to tolerate liberal interpretations of standards by managers when standards are imprecise (Nelson et al. [2002a], Hackenbrack and Nelson [1996], Trompeter [1994]), provided the penalties for adopting such interpretations are low (Nelson [2003]). This thesis focuses on the effect of a general reduction in accounting discretion on income smoothing; whether the reduction in discretion is a result of strict auditors, precise standards or a combination of both factors is not a consideration in this thesis. The discretion level in the experiment is therefore manipulated by specifying the percentage of operating earnings that can be adjusted using accounting provisions.

For each participant, there are two limits, one for total increase in provisions and another for total reduction in provisions. Participants are informed about their assigned discretion limits at the start of the experiment. The discretion limits remain unchanged for each participant throughout the experiment. The limit for decreases in accounting provisions in each period is assigned to participants using a uniform distribution with a range of 5-20%. The participants are informed about this distribution so they are aware that the discretion level is allocated to them with equal probability. The limit for

increases in provisions in each period is 1.5 times the assigned percentage for a decrease. For example, if a participant's limit for a decrease in provision is 10%, the corresponding limit for an increase in provisions will be 15%. An increase in accounting adjustments results in lower current earnings while a decrease in accounting adjustments leads to an increase in current earnings.

The use of a range of accounting discretion limits is motivated by the results in Nelson et al. [2002a], which show the level of accounting discretion varies among firms. The variation arises because accounting standards have different levels of precision and auditors have different interpretations of these standards (Amer et al. [1995], Amer et al. [1994]). The asymmetric discretion limits for increases and decreases in provisions are motivated by studies which show that auditors are more willing to accept accounting adjustments that lead to lower earnings than those that lead to higher earnings (Nelson et al. [2002a], St. Pierre and Anderson [1984]).

The participants can use their assigned discretion level to adjust three types of accounting provisions that have different periods of reversal: bad debt allowance reverses in one period, provision for restructuring expenses reverses over five periods (straight line) and provision for retirement benefits reverses over ten periods (straight line). The reversal of accounting adjustments, a feature of the accrual accounting system, is included to ensure that participants consider the impact of accounting adjustments on future earnings (Sunder [1997]). Barton and Simko [2002], for instance, show that the reversal of previous overstatements in earnings makes it more difficult for managers to overstate future earnings. Participants in the experiment can view the reversals of their accounting adjustments in each period in *Prospero*.

The monetary value of the discretion limit (DL_{it}) for each participant in each period is computed by multiplying the assigned percentage limit (L_i) with the accounting earnings before current period's accounting adjustments (AE_{it}). The computation of AE_{it} and DL_{it} is given in equations 4.2a and 4.2b respectively.

$$AE_{it} = \left(OR_{it} - Dep_{it} - Adv_{it} - RD_{it}\right) + URV_{it} - DRV_{it} \quad (4.2a)$$

$$DL_{it} = AE_{it} \times L_i \quad (4.2b)$$

where OR_{it} is the operating revenue in equation 4.1, and Dep_{it}, Adv_{it}, and RD_{it} are, respectively, equipment depreciation, advertising expenditure and R&D expenditure in period t. The depreciation expense is computed from a useful life of ten years for equipment. Both advertising and R&D are expensed when incurred. URV_{it} is the amount of reversals in period t due to an increase in provisions in previous periods, and DRV_{it} is the amount of reversals in period t due to a decrease in provisions in previous periods.

4.2.4 Measurement of Smoothing Performance

Based on the definition of income smoothing adopted in this thesis, a score was developed to measure the ability of participants to report smooth increasing earnings. This score is defined as the simple difference between the mean and standard deviation of the change in reported earnings. Theoretical studies on income smoothing also adopt a linear formulation (Chaney and Lewis [1995], Gonedes [1972]). In Gonedes [1972] p. 574, the smoothing objective of a firm is defined as the maximization of earnings over time, subject to a penalty for volatile earnings. The two-period smoothing model in Chaney and Lewis [1995], which allows managers to affect both the mean and variance of reported earnings, is also linear. Given that is no theoretical guidance on the

appropriate weights for the mean and standard deviation, a simple difference is used for the score. An analysis of other possible score definitions is given in Chapter 7.

An alternative smoothing measure that could be used in this thesis is the inverse of the ratio of standard deviation of earnings change to the mean of earnings change. This ratio is a variant of the coefficient of variation used in the finance literature (e.g., Reilly 1994). However, this measure is not adopted in this thesis because the measure becomes meaningless when the denominator is very small or negative, which may occur in the experiment.

The score is calculated from reported earnings (RE_{it}), which are computed as follows:

$$RE_{it} = AE_{it} - UAA_{it} + DAA_{it} \tag{4.3}$$

where AE_{it} is accounting earnings from equation 4.2a, and UAA_{it} (DAA_{it}) is the amount of increase (decrease) in accounting provisions made by the participant in the current period.

Given that participants are required to report increasing earnings over time, the growth in earnings will result in a non-stationary mean (Pindyck and Rubinfeld [1991], Foster [1986]). However, the calculation of standard deviation of a set of numbers requires a stationary mean (Barth et al. [1999], Hunt et al. [1997]). By computing the change in earnings (or first-differencing of the earnings series), stationarity of a time series can be obtained (Barth et al. [1999], Pindyck and Rubinfeld [1991]). The change in reported earnings from period t-1 to period t is given by x_{it} where

$$x_{it} = RE_{it} - RE_{it-1} \tag{4.4}$$

RE_{it} is the reported earnings in time t for participant i. As a result of implementing a random end to the experiment, a complete set of data is available only for the first 12

periods. The random end is employed to avoid gaming by participants towards the end of the experiment (Friedman and Sunder [1994]). The random end is chosen from a discrete uniform distribution with a range of 12 to 15 periods. This distribution is not revealed to the participants. However, the participants are informed about the minimum 12 periods in order to satisfy the requirements of the University's research ethics committee.

For analysis, the data for the first 12 periods are used, which result in a set of 11 values for the change in earnings (x_2 , x_3.... x_{12}) for each participant. A moving average ($\overline{X}_{it}$) for the change in earnings is calculated in each period t and is given by

$$\overline{X}_{it} = \frac{1}{t-1}\sum_{j=2}^{t} x_{ij} . \qquad t = 2, ...,12 \qquad (4.5)$$

Similarly, the standard deviation for the change in earnings (σ_{it}) is calculated in each period t and is given by

$$\sigma_{it} = \sqrt{\frac{1}{t-1}\sum_{j=2}^{t}\left(x_{ij} - \overline{X}_{it}\right)^2} \qquad t = 2, ...,12 \qquad (4.6)$$

The score, used to measure the earnings performance of the participant i in period t, is given by

$$Score_{it} = \overline{X}_{it} - \sigma_{it} \qquad (4.7)$$

If t = 5, the score reflects how well the participant reports smooth increasing earnings over the current and previous four periods, and if t = 10, the score reflects the earnings performance over the current and previous nine periods. A large positive score indicates that the firm has high earnings change but at a low variability. A negative score is obtained when σ_{it} is greater than $\overline{X}_{it}$, or when $\overline{X}_{it}$ is negative.

4.3 PROSPERO

4.3.1 Overview of user interface

Section 4.3 describes the graphical user interface of *Prospero*. An overview of how the user interacts with the two main decision screens is provided in Figures 4.1 and 4.2. These flowcharts apply to both high and low foresight participants. Figure 4.1 contains a flowchart demonstrating how a user interacts with the *Investment* dialog box (Figure 4.4) at the beginning of each period in the experiment. Figure 4.2 provides the flowchart for user interaction with the *Accounting* dialog box (Figure 4.5) at the end of each period in the experiment. Both flowcharts refer to the dialog boxes in Figures 4.3 to 4.5. Reference to these figures is required in order to obtain an understanding of the flowcharts. A detailed explanation of all screens available in *Prospero* is provided in sections 4.3.2 to 4.3.6.

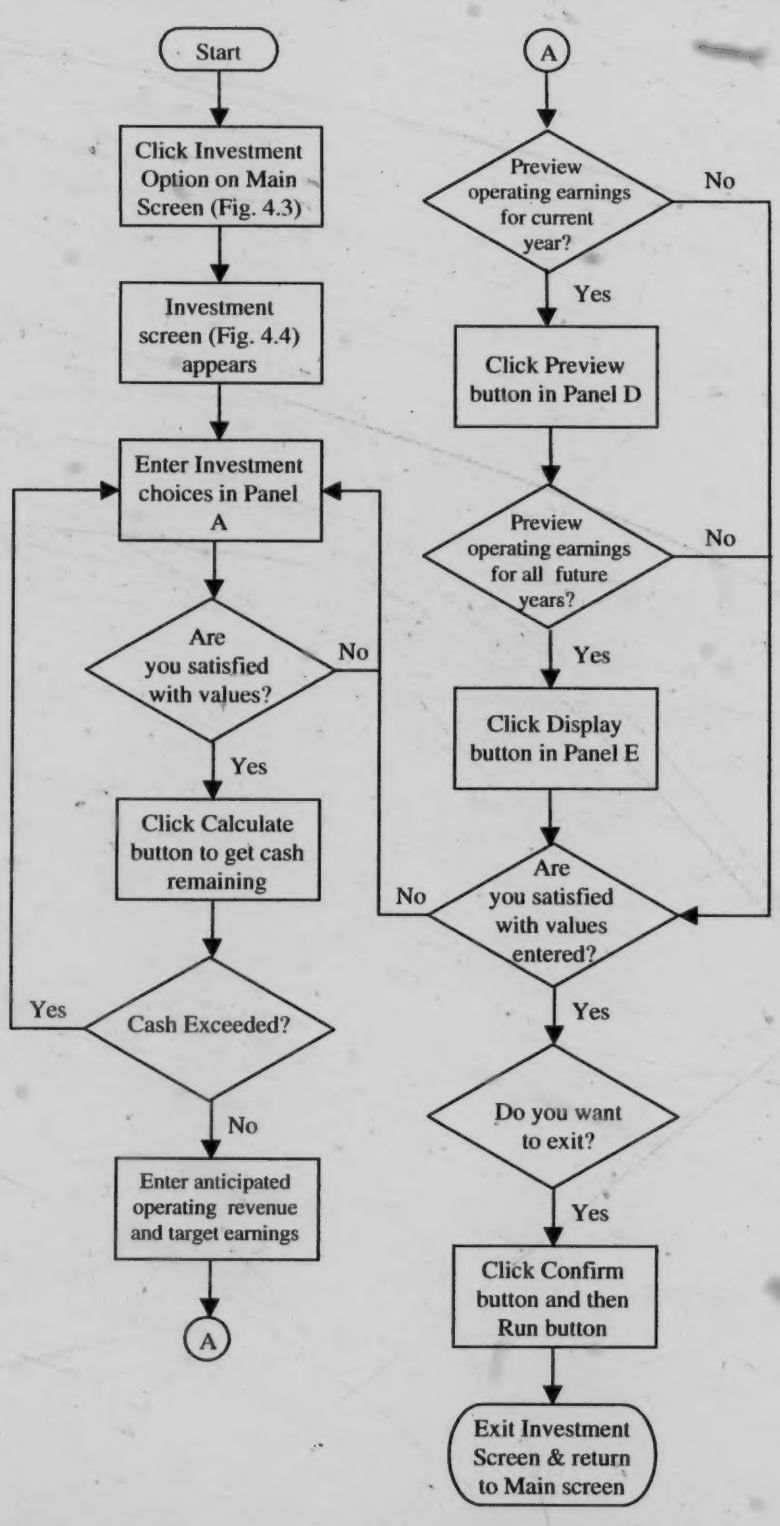


FIGURE 4.1 Flowchart showing a user's interaction with the *Investment* dialog box

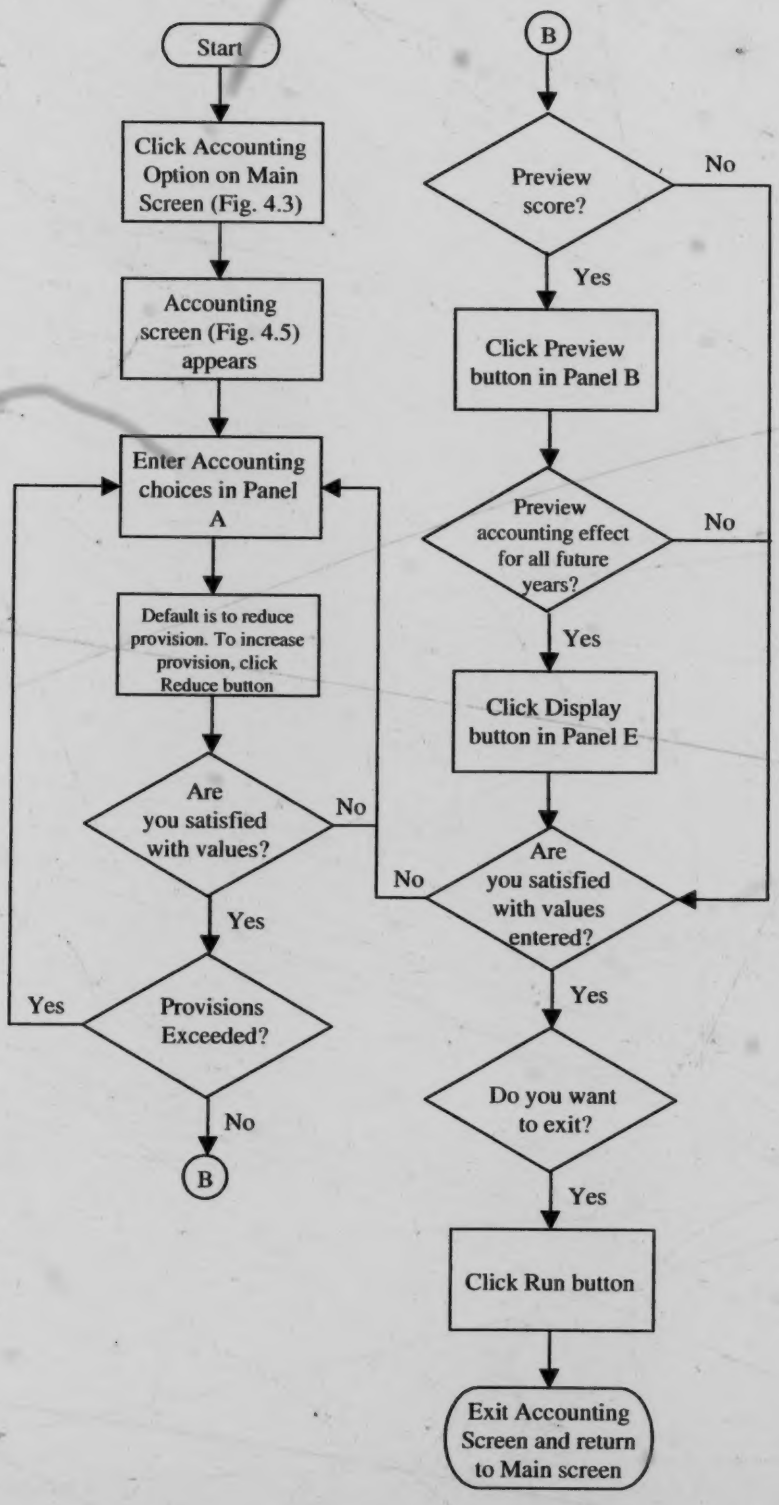


FIGURE 4.2 Flowchart showing a user's interaction with the *Accounting* dialog box

4.3.2 Main menu

The first dialog box that the participant interacts with is the *Main* dialog box. Figure 4.3 shows the *Main* dialog box with a menu bar containing the menus - *Decisions*, *Results*, *History*, *Future*, *Session*, *Setup*, and *Help*. The *Decisions* menu provides a choice of *Investment* and *Accounting* decisions. The *Results* menu offers three displays of results: *Operating earnings*, *Reported earnings*, and *Score*. The *History of Decisions*, and *History of Operating* and *Reported Earnings* are available in the *History* menu. The *Future* menu provides the effect of decisions on future earnings. Both the *Session* and *Setup* menus are used by the experimenter to initialise the program and are not available to the participants. The *Help* menu provides information on how to operate *Prospero*.

FIGURE 4.3 *Main* dialog box for all participants

4.3.3 Decisions menu

4.3.3.1 Investment decision

Participants enter their investment decisions at the beginning of the period and accounting decisions at the end of the period. The *Investment* dialog box is obtained when *Investment* is selected from the *Decision* menu. Figure 4.4 presents the *Investment* dialog box for high foresight participants. The call-out boxes in Figure 4.4 indicate components of the dialog box that differ between the high and low foresight groups. The *Investment* dialog box is organised into two data entry panels (Panels A and B), an information panel (Panel C), two preview of results panels (Panels D and E) and two history of decisions and results panels (Panel F and G).

The accounting discretion limit assigned to the participant is shown in Panel C. Panels A and B are the data entry panels for investment decisions and earnings expectation respectively. In Panel A, participants enter the amount to be invested in equipment, advertising and R&D in the data entry boxes. The *Calculate* button computes the total investment in the current period, and checks that the total investment does not exceed the amount of cash available. In Panel B, participants enter their estimate of current period's operating revenue from investments and their target reported earnings. Participants can obtain the score based on their estimate of reported earnings by clicking the *Confirm* button.

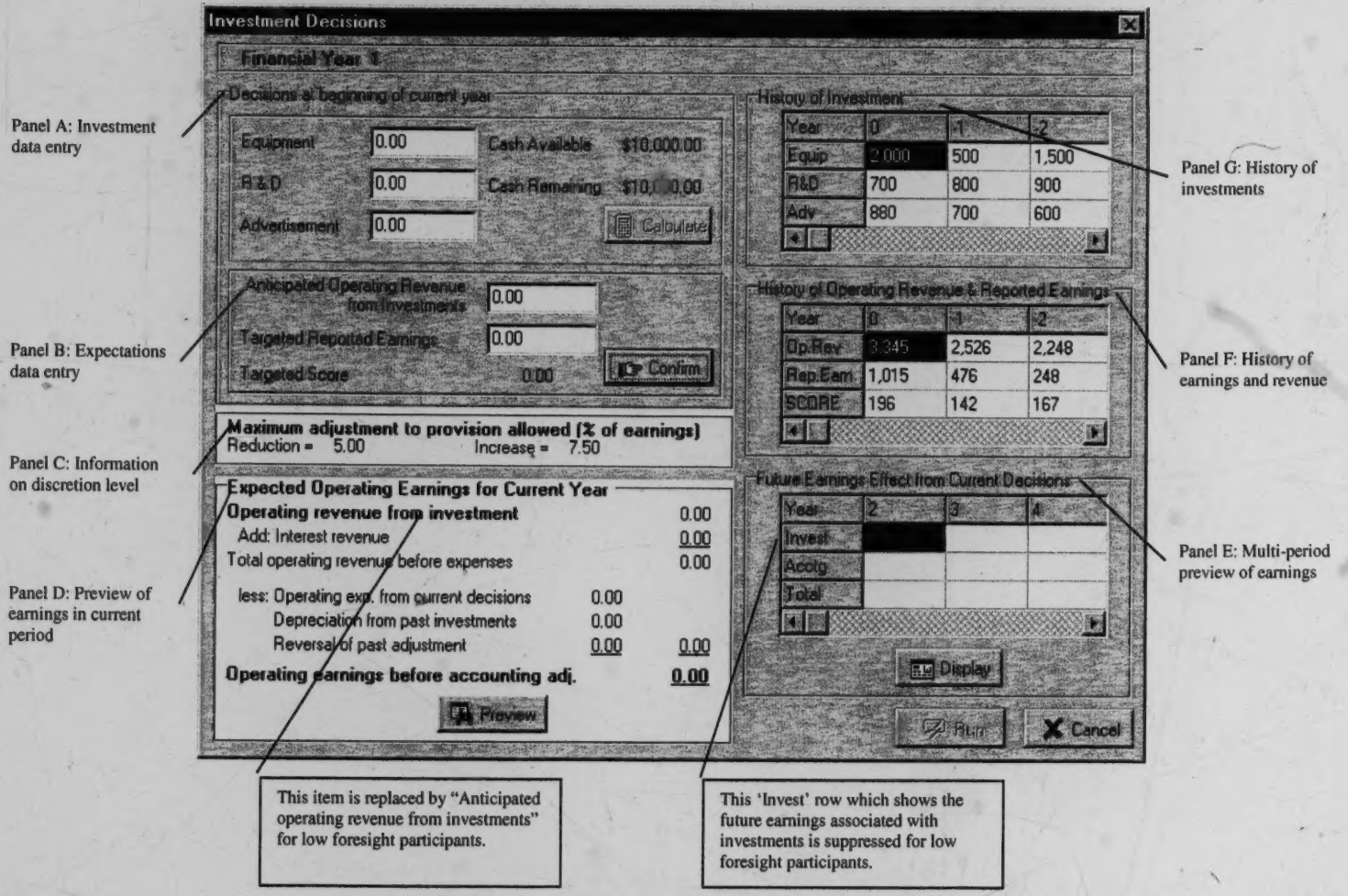

Investment Decisions
Financial Year 1
Decisions at beginning of current year
Equipment 0.00
R&D 0.00
Advertisement 0.00
Cash Available $10,000.00
Cash Remaining $10,000.00
Calculate
Anticipated Operating Revenue from Investments 0.00
Targeted Reported Earnings 0.00
Targeted Score 0.00
Confirm
Maximum adjustment to provision allowed (% of earnings)
Reduction = 5.00 Increase = 7.50
Expected Operating Earnings for Current Year
Operating revenue from investment 0.00
Add: Interest revenue 0.00
Total operating revenue before expenses 0.00
less: Operating exp. from current decisions 0.00
Depreciation from past investments 0.00
Reversal of past adjustment 0.00 0.00
Operating earnings before accounting adj. 0.00
Preview
History of Investment
Year 0 -1 -2
Equip 2,000 500 1,500
R&D 700 800 900
Adv 880 700 600
History of Operating Revenue & Reported Earnings
Year 0 -1 -2
Op.Rev 3,345 2,526 2,248
Rep.Earn 1,015 476 248
SCORE 196 142 167
Future Earnings Effect from Current Decisions
Year 2 3 4
Invest
Accrtg
Total
Display
Run
Cancel
Panel A: Investment data entry
Panel B: Expectations data entry
Panel C: Information on discretion level
Panel D: Preview of earnings in current period
Panel G: History of investments
Panel F: History of earnings and revenue
Panel E: Multi-period preview of earnings
This item is replaced by "Anticipated operating revenue from investments" for low foresight participants.
This 'Invest' row which shows the future earnings associated with investments is suppressed for low foresight participants.

FIGURE 4.4 *Investment* dialog box for high foresight participants

For high foresight participants, Panel D contains the operating revenue from investments, which is calculated from equation 4.1 excluding the error term. This information provides the participants with an indication of the actual operating revenue for the period. The operating earnings before adjustments in Panel D also allow participants to determine whether their target reported earnings in Panel B are realistic. Panel E provides a summary of the estimated earnings for all future periods resulting from the participant's current and previous investment decisions. Participants can make changes to their investments until they are satisfied with their investment plan.

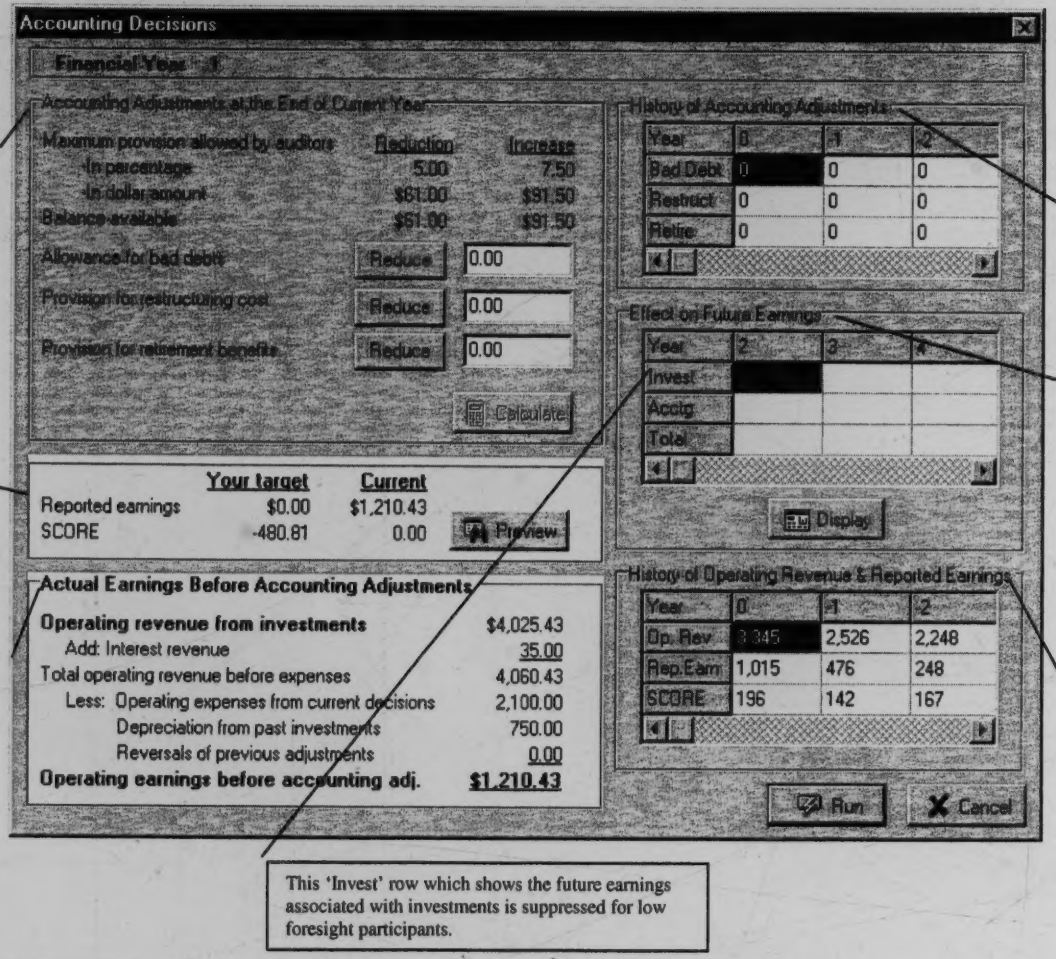
For low foresight participants, Panel D uses the participants' estimate of operating revenue in Panel B to compute operating earnings before accounting adjustments. The accuracy of operating earnings therefore depends on the accuracy of the participants' estimate of operating revenue. For low foresight participants, the historical information on investments, earnings and scores in Panels G and F are likely to be more useful for their decision-making. Panel E in the *Investment* dialog box for low foresight participants does not provide any information on the estimated earnings from investment decisions.

The participants click the *Run* button after they have finalised their investment decisions. A close query dialog box prompts participants to confirm their decision to exit the *Investment* dialog box. Once the participants exit the dialog box, they are not allowed to return to it to make further changes. The participants then proceed to make accounting decisions.

4.3.3.2 Accounting decision

Figure 4.5 shows the *Accounting Decision* dialog box. It contains a data entry panel (Panel A), two information panels (Panels B and C), two historical data panels (Panels D and F), and a panel on the effect of decisions on future earnings (Panel E). The actual operating earnings before any accounting adjustments for the current period are given in Panel C. The operating revenue from investments in this panel is computed from equation 4.1. The difference between this operating revenue and that in Panel D of Figure 4.4 is the random term. Based on the operating earnings in Panel C, the participant decides whether to make adjustments to accounting provisions. The maximum amount of accounting adjustments for the period is given in Panel A. A choice of three types of provisions, namely, allowance for bad debts, provision for restructuring expenses, and provision for retirement benefits, is available to the participant. As discussed in Section 4.2.3, the accounting provisions have different periods of reversal, which is made known to the participants. The participant indicates the nature of adjustment (an increase or a reduction) by clicking the button next to the data entry box. The *Calculate* button determines whether the adjustments entered by the participant exceed the accounting limits.

The effect of the accounting adjustments on reported earnings and the score is obtained by clicking the *Preview* button in Panel B. The effect of the accounting adjustment on future earnings is available by clicking the *Display* button in Panel E. Other information available for the participant's decision making includes the history of earnings and scores (Panel D), and the history of accounting adjustments (Panel F).



Panel A: Accounting data entry

Panel B: Information on score

Panel C: Information on current period's actual earnings

Panel F: History of accounting adjustments

Panel E: Multi-period preview of earnings

Panel D: History of earnings and revenue

This 'Invest' row which shows the future earnings associated with investments is suppressed for low foresight participants.

FIGURE 4.5 ***Accounting*** **dialog box for high foresight participants**

Once the accounting decisions are made, the participants click the *Run* button to exit the *Accounting Decision* dialog box. A close query dialog box is displayed and this requires the participants to confirm their intention to exit the dialog box. Upon confirmation, the participants are not allowed to make further changes to their accounting decisions. A new financial period then begins and the investment and accounting decision process is repeated until the random end is reached.

4.3.4 Results menu

Participants can view the results of their decisions by choosing the *Results* menu in the *Main* dialog box at any time during the experiment. The three outputs, namely, *Statement of Operating Earnings*, *Statement of Reported Earnings*, and *Statement of Scores*, are given in Figures 4.6, 4.7 and 4.8 respectively. The *Statement of Operating Earnings* exhibits the components of operating earnings before accounting adjustments. The *Statement of Reported Earnings* shows the same earnings components as well as the accounting adjustments for the current period. The *Statement of Scores* presents the scores for all periods in graphical and tabular format. In each period, the *Statement of Operating Earnings* is available after investment decisions are made, while the *Statement of Reported Earnings* is available after accounting decisions are made. The *Statement of Scores* is available at any time during the experiment.

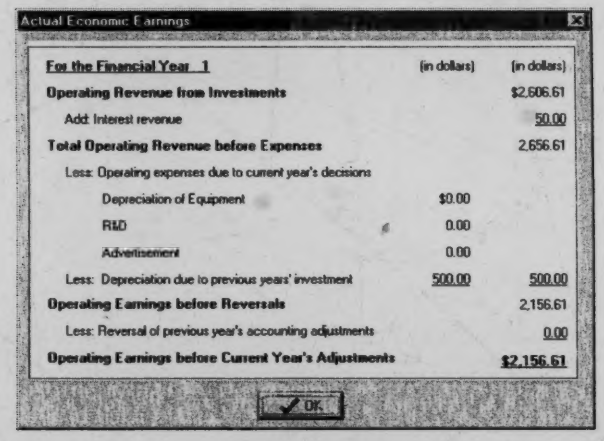


FIGURE 4.6 Statement of operating earnings before current year's accounting adjustments

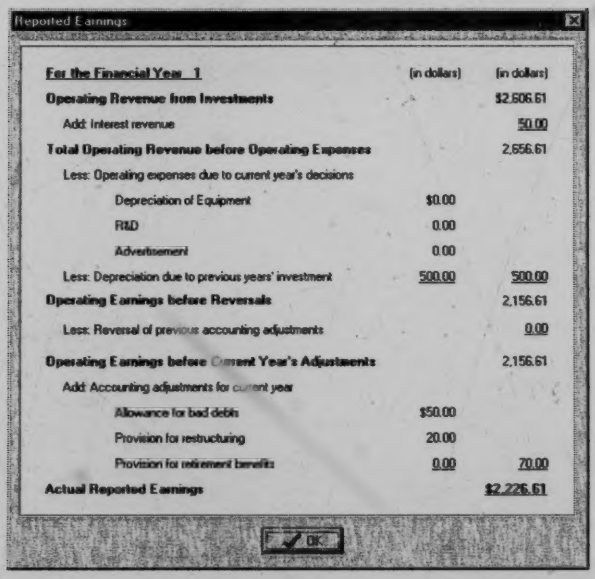


FIGURE 4.7 Statement of reported earnings

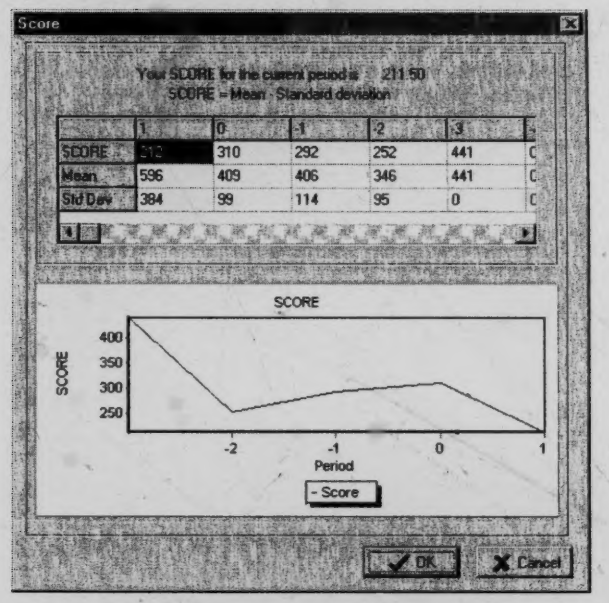


FIGURE 4.8 Statement of scores

4.3.5 History menu

At any time during the experiment, participants can also view the history of their decisions and the history of earnings resulting from their decisions. Figure 4.9 shows the history of investments and accounting adjustments, and Figure 4.10 shows the history of earnings and operating revenue in tabular and graphical format.

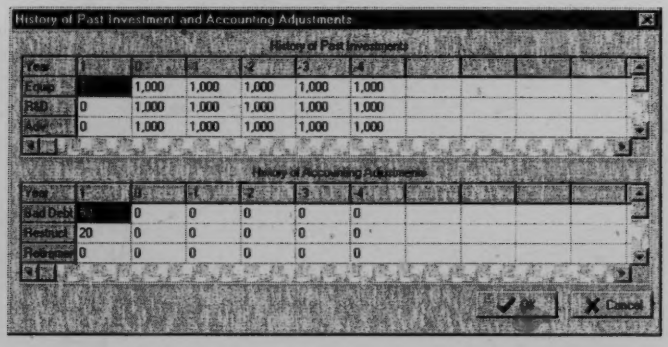


FIGURE 4.9 History of investments and accounting adjustments

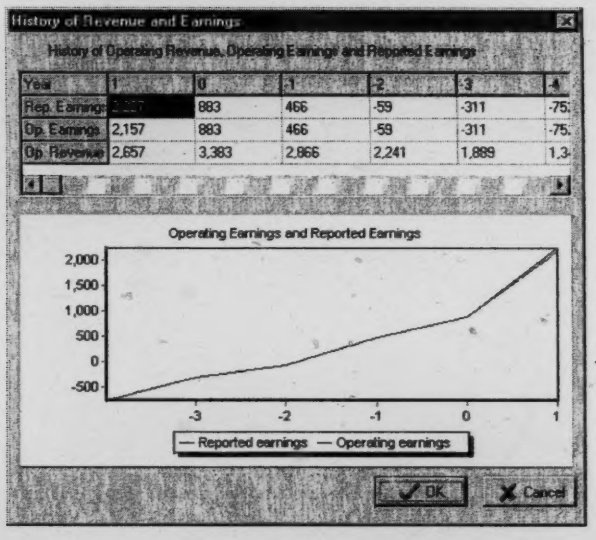


FIGURE 4.10 History of operating revenue, operating earnings and reported earnings

4.3.6 Future menu

Figure 4.11 presents the table that shows the effect of current decisions on future earnings for high foresight participants. For low foresight participants, only information in the *Accounting* row is provided. This table is also replicated in Panel E of both *Investment* and *Accounting* dialog boxes (Figures 4.4 and 4.5 respectively).

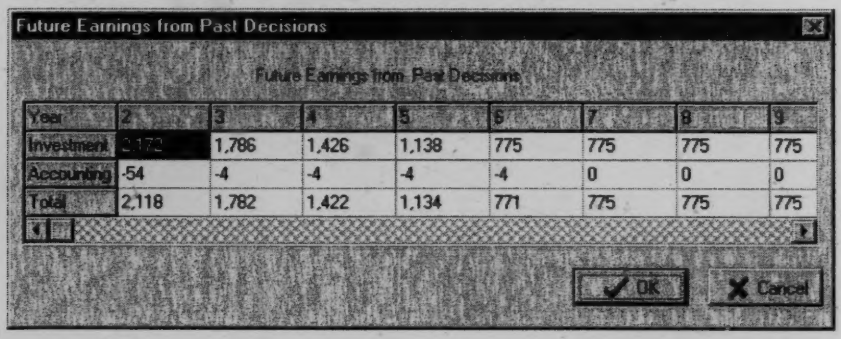

Future Earnings from Past Decisions
Future Earnings from Past Decisions
Year 2 3 4 5 6 7 8 9
Investment 1,786 1,426 1,138 775 775 775 775
Accounting -54 -4 -4 -4 -4 0 0 0
Total 2,118 1,782 1,422 1,134 771 775 775 775
OK
Cancel

FIGURE 4.11 Statement of effect of past decisions on future earnings

4.4 METHOD

4.4.1 Participants

In the experiment, participants were assigned to either a high or a low foresight condition. High foresight participants were provided with the algorithm used to convert their investment decisions into earnings. They were also provided with two decision aids, one to assist their investment decisions and one for accounting decisions. Low foresight participants were not told the algorithm, and were not provided with the decision aid for making investment decisions. To operationalise the low foresight condition so that the participants in this condition had a reasonable chance of performing well in the experimental task, the following actions were taken: (1) experienced financial managers were recruited so that their knowledge of operating activity and accounting would assist them in their smoothing decisions during the experiment; (2) meaningful labels, such as advertising, equipment, and R&D were assigned to the assets so that participants could learn faster and develop reasonable expectations on the variability and duration of earnings from investments made in each of these assets, and (3) the same accounting decision aid given to the high foresight participants was provided to low foresight participants.

One hundred financial managers from 16 firms in ten different industries (construction, forestry, manufacturing, oil and gas, retail, telecommunications, financial, property, service and utilities) located in two large cities participated in the experiment. Twenty-four firms were approached and 18 firms agreed to take part (response rate = 75%). Given that the target of 100 participants was achieved with 16 firms, the experiment was not carried out on the remaining two firms that agreed to participate. The

Chief Financial Officer in each firm was asked to participate in the experiment, and to identify five to ten senior staff with financial reporting or accounting experience who were willing to participate. Participants had an average of 11 years of financial work experience. The managers hold one or more of the following professional accounting designations: CA or CPA(36%), CMA (47%), CFA (7%), and CGA (4%). Eleven percent of the managers also possess a MBA. Thirteen managers have more than one qualification.

4.4.2 Procedure

The experiment was conducted at either the University's laboratory or the firm's premises. Two firms (19 participants) chose the former option, and the rest chose the latter. All participants from the same firm and experimental session were assigned to either a high or low foresight condition. Since the firms provided different numbers of participants, nine firms were assigned to the high foresight condition and seven to the low foresight condition. This method of assignment results in a better utilisation of participants' time and the firms' computer resources. There were 50 participants in each foresight condition. The total accounting limit for decreases in provision is assigned to participants at the beginning of the experiment using a uniform distribution with a range of 5-20% of operating earnings for the discretion limit. The experiment was carried out in three phases, which are described in sections 4.4.2.1 to 4.4.2.3.

4.4.2.1 Phase 1: Overview of experiment

In phase one, pre-numbered envelopes containing an information letter, two consent forms, and instructions for the experiment were distributed to the participants. The information letter and consent forms are given in Appendix A. The same information letter and consent forms were provided to both foresight groups. The instructions for the experiment are given in Appendix B. These instructions are for high foresight participants. Low foresight participants were given the same instructions except that the subsections entitled "Operating Revenue" and "Explanation of equation" were excluded. The information letter was a requirement of the University's research ethics committee. It laid out the procedures for maintaining anonymity of the participants and the reward structure. After reading the information letter, the participants signed a consent form for participation and a second consent form for publicity in the event that they were winners.

The experimenter then acknowledged the contribution of the participants, and each participant received a School of Business souvenir pen worth $15. All participants were told that their objective in the experiment was to report smooth increasing earnings for their firm over time, and that both operational and accounting instruments could be used to achieve their targets. To avoid ethical interpretations of the experiment, the term earnings management was not used throughout the experiment. They were also informed about the existence of two foresight conditions and their assigned foresight condition. The assignment of the accounting discretion limit, and the random end to the experiment were also discussed. The participants were informed that for each foresight condition, those with the highest three scores in their respective final experimental period would be declared winners, and would be given a School of Business souvenir clock valued at $35.

A summary of the experiment, together with the names and photographs of the winners, would also be published in a professional magazine read by their peers. The publication focused on the participant's ability to combine operational and accounting decisions to report smooth increasing earnings.

4.4.2.2 Phase 2: Training of participants

The second phase of the experiment trained participants on how to use *Prospero*. A detailed explanation of the score was also provided during this phase (Appendix B). At the end of the training session, a manipulation check (Appendix C) was administered to determine how well participants understood the relationship between investments and earnings. The presentation took an average of 45 minutes for the low foresight group, and one hour for the high foresight group. The participants took a further 20-30 minutes to familiarise themselves with *Prospero*.

The training instructions on Prospero for both foresight groups were the same except that only high foresight participants were given information on equation 4.1 (Appendix B). In the instructions, participants were told that investment decisions would be made at the beginning of each period, and accounting decisions at the end of the period. A sum of electronic money was given to the participants at the beginning of the experiment to invest in equipment, R&D and advertising. Any unspent cash and cash generated from investments was made available for future investments. Once the investment decisions were finalised, the actual operating earnings were computed, and the participants proceeded to make their accounting decisions. The parameters used to initialise *Prospero* for the training session are given in Table 4.1. In the training session, the simulated firm

had a randomly generated five-period history, which was common to all participants. Participants were given a further five periods for decision making. Upon completion of the training session, participants completed the manipulation check form.

TABLE 4.1 Key features and parameter values used in the training and actual sessions

	Parameter Values	
Parameters	*Training session*	*Actual session*
1. Initial endowment	$10,000.	$80,000.
2. No of periods for decision making	Five.	Not less than 12. End of experiment unknown to participants.
3. Investment history	Five-period history	None
4. Accounting limit	All participants assigned 5% of operating earnings for decreases in accounting provisions, and a 7.5% (1.5 x 5%) limit for increases in accounting provisions.	The total accounting limit for decreases in provision is assigned to participants using a uniform distribution with a range of 5-20% of operating earnings.The limit for increases in provisions is 1.5 times the downward limit. For every participant, the percentage accounting limit, once assigned, remains unchanged throughout the experiment.

4.4.2.3 Phase 3: Actual session

In phase three, participants performed the actual experiment. The parameters used for the actual session are given in Table 4.1. As in the training session, the investment decisions in each period were entered first, followed by accounting decisions. The program was automatically disabled upon reaching the random end. At the end of the actual session, a manipulation check (Appendix D) was administered. Participants were

also asked to provide information on their firm, current job title, years of experience in accounting or financial reporting, and educational and professional backgrounds. An average of one hour and five minutes was spent on the actual session. The high foresight participants took an average of one hour and eleven minutes, and the low foresight participants took an average of one hour. Fifty-five participants requested a summary of the results of the experiment and their relative performance in the experiment.

4.4.3 Comparison with Koch [1981]

There is one known study by Koch [1981] who used an experimental approach to examine whether managers trade off the level of earnings against the variability of earnings when smoothing earnings. Koch examines how the trade-off is affected by a firm's shareholding and the type of smoothing instrument. Similar to Koch, this thesis also employs managers as subjects. The key difference between the experiment in this thesis and that in Koch [1981] is that this thesis focuses on the effect of discretion and foresight on a manager's ability to smooth earnings. Both these variables are not examined in Koch [1981]. The set-up of the experiment in this thesis and that of Koch [1981] is also different. This thesis employs a experimental setting based on interactive computer simulations to examine multi-period earnings management; Koch uses a manual instrument for his experiment. The advantage of a computerised environment is that managers can make their own investment and accounting decisions and can monitor effects of their decisions over time. The managers are also able to use both accounting and real variables to achieve their smooth earnings. Both these features are absent in

Koch's experiment. Koch allows managers to use either accounting or real variables to smooth earnings, but not both.

5 DESCRIPTIVE STATISTICS AND MANIPULATION CHECKS

5.1 INTRODUCTION

This chapter provides descriptive statistics of the experimental sample (Section 5.2) and results on whether foresight has been successfully manipulated (Section 5.3). In the experiment, high foresight participants are given information on the relationship between investments and earnings. They are also provided with decision aids that enable them to predict earnings based on their investment plan. Two tests are conducted to determine whether foresight has been successfully manipulated. One test examines the participants' understanding of the relationship between investments and earnings based on their responses to the questionnaires administered after the experiment. The second test examines the usage of decision aids on the *Investment* dialog box by foresight groups. The results from both tests indicate that foresight has been successfully manipulated.

5.2 DESCRIPTIVE STATISTICS

5.2.1 Scores and the behaviour of earnings

Figures 5.1a to 5.1c present the reported earnings series generated by the six foresight × discretion groups. The three accounting discretion categories are obtained by dividing the discretion levels assigned to the participants into three categories: low discretion (<10%), moderate discretion (10-15%), and high discretion (16-20%). The earnings series plotted in these figures are segregated by the foresight of the participant and level of discretion.

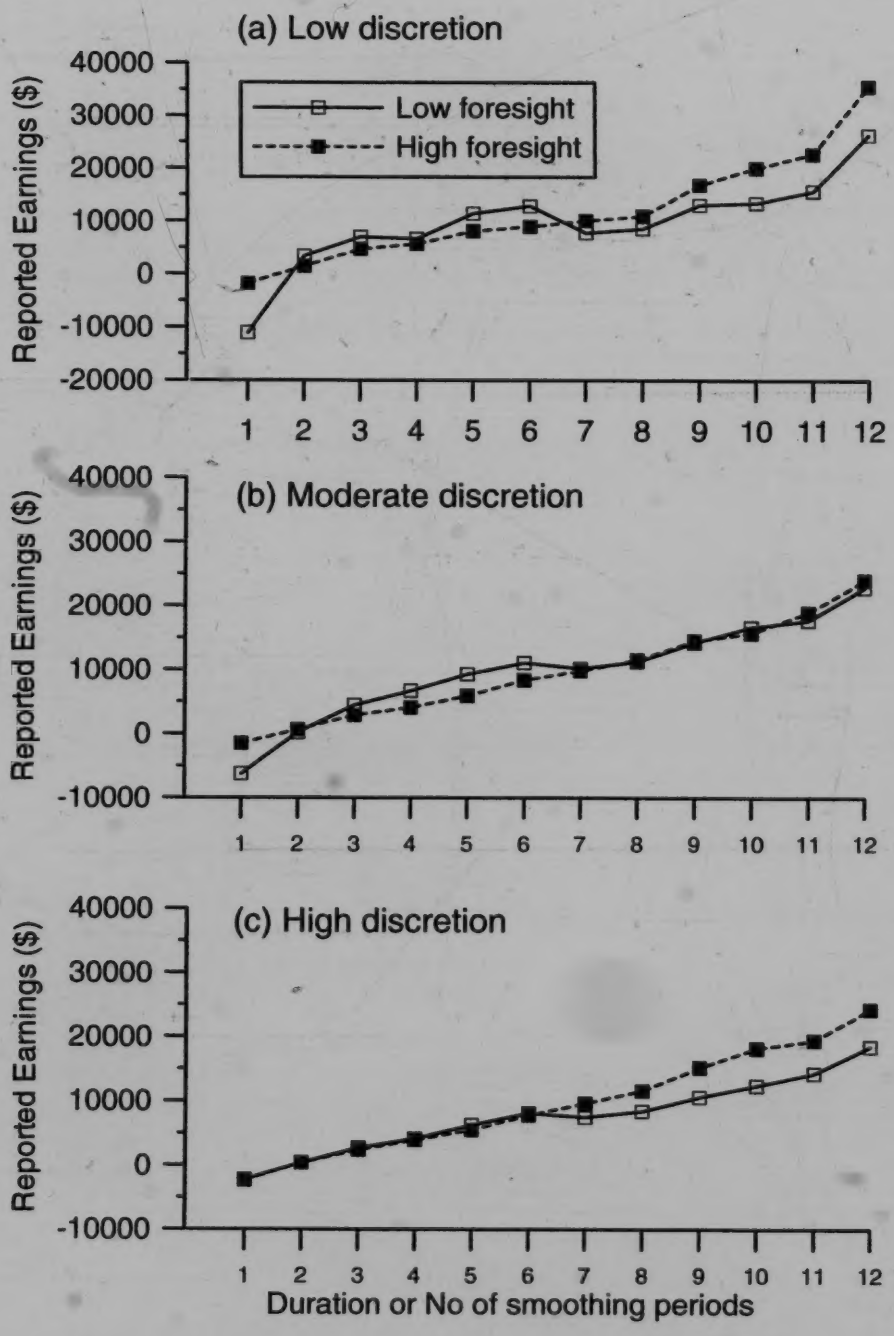


FIGURE 5.1 Reported earnings of participants by level of discretion

Generally, the earnings series appear more variable when accounting discretion is reduced. Figure 5.1a shows that the earnings reported by the low foresight participants appear more variable than those reported by the high foresight participants. The earnings series for the two groups of foresight managers in Figure 5.1b appear similar. The same observation is made for Figure 5.1c. In Figures 5.1a and 5.1c, however, the level of earnings for the low foresight group declines below that of the high foresight group when the periods increase.

Panel B in Table 5.1 presents the scores used in the experiment to capture the relative differences in the level and variability of these six earnings series presented in Figures 5.1a to 5.1c. The mean and median scores at period 12, and their components are provided in the panel. In panel A of Table 5.1, the sample size for each of the foresight × discretion cells is presented.

TABLE 5.1 Descriptive statistics for the six foresight × discretion groups

Panel A: Cell sample sizes

Accounting Discretion Limits	*Low foresight*	*High foresight*
Low	11	17
Moderate	25	15
High	14	18
Total	50	50

Panel B: Median score and mean score and its components at the 12th period

	(a) *Mean Score* (a) = (b)–(c)		(b) *Mean of change in earnings*		(c) *Standard deviation of change in earnings*		(d) *Median Score*	
Discretion level	*Foresight*		*Foresight*		*Foresight*		*Foresight*	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Low	-2776.91	-492.13	3396.17	3394.27	6173.08	3886.40	-1261.28	-310.35
Moderate	-449.56	276.44	2643.90	2317.02	3093.46	2040.58	-386.79	68.02
High	18.37	212.13	1885.53	2425.39	1867.16	2213.25	-54.27	564.8

Panel B in Table 5.1 shows that the group with low foresight and low discretion has the largest negative mean score (–2776.91). The group with high foresight and high discretion has a positive mean score (212.13), but the highest positive mean score comes from the group with high foresight and moderate discretion (276.44). The median scores indicate a similar trend, except that the highest median score is obtained by the group with high foresight and high discretion. Both the mean and median statistics show that given the same level of accounting discretion, the high foresight group has a larger score than the low foresight group. The groups with negative scores have standard deviations that are greater than the mean change in earnings.

An examination of Table 5.1 also shows that the mean in each cell is different from its corresponding median. To test whether the median and mean are significantly different

for each cell, the non-parametric sign test (Conover [1980]) is employed to test the null hypothesis that the population median for each cell is equal to its mean value. None of the *p*-values is significant, which indicates that the two sets of measures of location are not significantly different.

5.2.2 Deviation of reported earnings from target earnings

In the experiment, the foresight of participants was manipulated by revealing more information about future earnings to the high foresight participants. This information enables high foresight participants to plan their investment strategies in a way that achieves their target earnings. The reported earnings of high foresight participants are therefore expected to be closer to their target earnings in each period. Target earnings are set by the participants at the beginning of the financial period. The ability of participants to achieve their target earnings over the entire 12 periods is measured by the absolute difference between the target reported earnings and actual reported earnings before accounting adjustments for all periods, expressed as a percentage of target reported earnings. The computation is given in equation 5.1.

$$Earnings\ Deviation(\%) = \frac{1}{N}\sum_{n=1}^{N}\left|\frac{AE_n - TE_n}{TE_n}\right| \times 100 \qquad (5.1)$$

where TE_n is the target reported earnings in period n, AE_n is the actual earnings in period n before period n's accounting adjustments, and N is the number of periods in which target earnings are provided. The analysis for *Earnings Deviation* assumes that the target earnings are an accurate reflection of what participants hope to achieve for the financial period. It should be noted that high foresight participants are in a better position than low foresight participants to define their target earnings accurately because the former are

given more information about the relationship between earnings and investments. Therefore the inability of low foresight participants to specify their target earnings accurately may increase the *Earning Deviation* for this group of participants.

TABLE 5.2 Comparison of the difference between actual earnings and target earnings by foresight groups

	Percent Earnings Deviation (%) (before accounting adjustments)		*Percent Earnings Deviation (%) (after accounting adjustments)*	
Foresight	*Mean*	*Median*	*Mean*	*Median*
Low	55.44	47.54	48.58	39.85
High	36.12	32.98	28.26	25.45
p-value	0.007	0.034	0.009	0.001

Table 5.2 presents the results for *Earnings Deviation* by foresight groups. Given that the setting of target earnings is not necessary for the experiment to proceed, but is used by participants to guide their decisions, it is expected that some participants may omit entering these values during the course of the experiment. Twenty-five participants did not provide target earnings for all 12 periods. Twelve of these participants are from the high foresight group and the rest are from the low foresight group. Out of these twenty-five participants, sixteen participants did not provide target earnings in one of the 12 periods. Nine participants did not provide target earnings in more than one period. For these twenty-five participants, the *Earnings Deviation* is computed over periods in which target earnings are available. The group which did not provide a complete set of target earnings did not have significantly different scores from the group which provided a complete set of target earnings (p-value = 0.638).

Column 2 in Table 5.2 shows that the earnings before accounting adjustments for the high foresight group are approximately 19% closer to their target earnings compared to the low foresight group. This difference between the two foresight groups is significant. Columns 4 and 5 in Table 5.2 show the results for *Earnings Deviation* when reported earnings are substituted for actual earnings before accounting adjustments. The *Earnings Deviation* is expected to be smaller given that participants use accounting adjustments to bring reported earnings closer to their target earnings. The mean *Earnings Deviation* for the low foresight group shows a decline of 6.86%, while the mean *Earnings Deviation* decreases by 7.86% for the high foresight group. The median *Earnings Deviation* also shows a decline for both groups.

Table 5.3 presents the *Earnings Deviation* for each of the foresight × discretion group. The deviation in earnings is measured with respect to actual reported earnings after accounting adjustments for all periods. Table 5.3 shows that both high and low foresight participants find it difficult to achieve their target earnings when discretion is low. The deviation of 44% for low foresight participants is not significantly different from the deviation of 32% obtained by high foresight participants. At a high discretion level, the deviation for low foresight participants is 41% compared to 26% for high foresight participants. The difference in the two deviations is significant. The mean for low foresight participants at moderate discretion appears to be higher than the two other discretion levels. The reason is that there is an observation in this group that has an earnings deviation of 363%. This arose because the participant expected a positive earnings but the actual earnings was negative. The highest deviation in the low and high discretion groups, in contrast, are 81% and 74% respectively. By omitting this

observation, the mean earnings deviation for low foresight participants at the moderate discretion is 41.82%. Using this mean for comparison with that of the high foresight participants, the *t*-test indicates a rejection of equal means (*p*-value = 0.037).

The results using medians are similar to those using the means. Unlike the results from the means, the difference in medians for moderate discretion is significant. In conclusion, these results show that although the deviation for both types of participants decreases with an increase in discretion, high foresight participants are better able to achieve their target earnings compared to low foresight participants at a higher levels of discretion.

TABLE 5.3 Comparison of the percentage difference between actual reported earnings and target earnings by foresight × discretion groups

	Mean			Median		
Discretion	*Low Foresight*	*High Foresight*	*p-value*	*Low Foresight*	*High Foresight*	*p-value*
Low	44.46	32.57	0.143	39.04	29.83	0.190
Moderate	54.65	26.00	0.134	40.65	19.17	0.012
High	40.98	26.06	0.024	42.09	22.85	0.022

5.3 RESULTS OF MANIPULATION CHECKS

This section tests whether the manipulation of foresight was successful in the experiment. The tests employ data obtained from: (1) the responses to the manipulation check questionnaire, and (2) the number of times participants accessed the decision aids available in *Prospero*.

5.3.1 Responses from manipulation check questionnaire

Manipulation checks were administered for both the training and actual sessions. A copy of the manipulation check form for the training session is given in Appendix C and that for the actual session is given in Appendix D. On the form, the participants were asked to indicate how well they understood the effect of a dollar in investment in each type of asset (equipment, R&D and advertising) on future operating earnings. The effect of investment on future operating earnings was measured in terms of its length of benefit and magnitude of benefit. A nine-point scale was used, with '1' representing no understanding and '9' representing complete understanding.

A test is conducted to determine whether the two foresight groups have the same level of understanding of the effect of investment on earnings within each category of investment. The results for both the training and actual sessions are presented in panels A and B of Table 5.4 respectively. The two panels show that for all types of assets, the level of understanding indicated by both foresight groups is significantly different. The high foresight group has a greater level of understanding than the low foresight group.

How the level of understanding changed between the two sessions is also examined for each foresight group. Panel C of Table 5.4 presents the results. Panel C shows that the understanding of the high foresight group did not change significantly between the training and actual sessions. In contrast, the low foresight group shows a significant improvement in their understanding of the effect of investment on future earnings. Their level of understanding during the actual session, however, is still significantly below that of the high foresight group, as indicated by the results in Panel B of Table 5.4. In

conclusion, the results in Table 5.4 indicate that the manipulation of foresight was successful.

TABLE 5.4 Results of analyses of manipulation checks administered after the training and actual sessions

Panel A: Training session

Effect of investment on future operating earnings measured in terms of:	*Mean level of understanding ('1'= no understanding, '9' = complete understanding)*		*t-statistic*	*p-values*
	High Foresight	*Low Foresight*		
(1) Amount of Benefit				
Equipment	6.52	4.38	6.09	<0.0001
Advertising	6.74	4.36	6.95	<0.0001
R&D	5.92	4.36	4.30	<0.0001
(2) Length of Benefit				
Equipment	6.84	4.04	7.20	<0.0001
Advertising	7.00	3.82	8.45	<0.0001
R&D	6.30	3.90	6.22	<0.0001

Panel B: Actual session

Effect of investment on future operating earnings measured in terms of :	*Level of understanding ('1'= no understanding, '9' = complete understanding)*		*t-statistic*	*p-values*
	High Foresight	*Low Foresight*		
(1) *Amount of Benefit*				
Equipment	6.82	5.26	4.21	<0.0001
Advertising	6.90	5.06	4.42	<0.0001
R&D	6.26	4.84	3.54	0.002
(2) *Length of Benefit*				
Equipment	6.82	5.14	3.92	0.000
Advertising	7.10	4.80	5.10	<0.0001
R&D	6.44	4.84	3.75	0.000

TABLE 5.4 (continued) Results of analyses of manipulation checks administered after the training and actual sessions

Panel C: Actual session versus training session

	High Foresight		*Low Foresight*	
	t-statistics	*p-values*	*t-statistics*	*p-values*
(1) *Amount of Benefit*				
Equipment	1.342	0.186	3.368	0.001
Advertising	-0.070	0.944	3.753	0.000
R&D	0.500	0.619	2.638	0.011
(2) *Length of Benefit*				
Equipment	0.247	0.806	3.099	0.003
Advertising	1.582	0.120	1.809	0.077
R&D	0.490	0.626	3.404	0.001

5.3.2 Participants' use of decision aids

Table 5.5 presents the number of times participants accessed the decision aids provided in the *Investment* and *Accounting* dialog boxes over the 12 smoothing periods. These results provide confirmation that both groups of participants carefully considered the impact of alternative investment and accounting scenarios on future earnings before deciding on the appropriate course of action. However, at all discretion levels, the high foresight group shows a significantly higher usage of the decision aids in the investment screen than the low foresight group. High foresight participants appear to rely significantly on the decision aid to plan their investment strategies. This is expected given that the decision aid for high foresight participants predicts the future earnings based on the participant's investment plan. These results therefore provide confirmation that the manipulation of foresight using the decision aids was successful. Table 5.5 also provides information on the usage of the decision aid in the *Accounting* screen. Although the low foresight group shows a higher usage of the decision aid in the *Accounting* screen, the

difference between the two foresight groups is not significant. The results based on the median provide similar conclusions about the successful manipulation of foresight using the decision aid.

TABLE 5.5 Number of times decision aids were accessed over the 12 periods of the experiment

Decision Screen	*Discretion*	*Mean number of times of access*			*Median number of times of access*		
		Foresight			*Foresight*		
		Low	*High*	*p-values*	*Low*	*High*	*p-values*
Investment	Low	39.3	77.8	0.001	36.0	67.0	0.008
	Moderate	46.3	107.7	<0.0001	40.0	93.0	0.004
	High	38.6	116.5	0.000	37.5	101.5	<0.0001
Accounting	Low	47.4	37.1	0.239	41.0	34.0	0.688
	Moderate	41.7	40.5	0.904	27.0	34.0	0.333
	High	37.8	53.8	0.113	34.0	47.5	0.483

6 MULTIVARIATE ANALYSIS

6.1 INTRODUCTION

This chapter provides the test of hypotheses H1 to H4 using two multivariate analysis techniques: multiple regression and MANOVA (similarly known as multivariate regression). The estimating equation is described in Section 6.2. The results are presented in Section 6.3, and a discussion of the results is given in Section 6.4. Sensitivity analysis for the results presented in this chapter is provided in Chapter 7.

6.2 ESTIMATING EQUATION

Th experiment has an unbalanced design due to a relatively higher assignment of participants to some foresight × discretion cells than others (see Chapter 5). With an unbalanced design, the hypotheses have to be tested using multiple regression, instead of ANOVA (Jobson [1991]). The estimating equation for testing the hypotheses is given in equation 6.1.

$$DV_i = \theta_1 + \alpha_1 Fore_i + \beta_1 Mod_i + \beta_2 High_i + \gamma_1 ForeMod_i + \gamma_2 ForeHigh_i + \varepsilon_i \qquad (6.1)$$

where *Fore* is a dummy variable with '1' representing high foresight, and '0' representing low foresight. Accounting discretion is divided into three categories, low discretion (<10%), moderate discretion (10-15%), and high discretion (16-20%). *Mod* and *High* are the dummy variables for moderate and high discretion respectively. The use of different partitions for accounting discretion and the use of accounting discretion as a continuous variable are examined in Chapter 7. The interaction between foresight and

these two categories of accounting discretion is given by: *ForeMod* = *Fore* × *Mod*, and *ForeHigh* = *Fore* × *High*. *DV* is the dependent variable appropriate to the specific hypothesis.

The dependent variable for hypotheses H1 and H3 is *Score12*, which is the score at the end of period 12. The results using scores at a period other than the 12th period are discussed in Chapter 7. Chapter 7 also provides regression results using other measures of smoothing performance such as standard deviation of earnings change, and the inverse of the coefficient of variation measure. The use of categories of scores instead of actual scores as the dependent variable is also evaluated in Chapter 7.

The dependent variables for hypothesis H2 are the percentage of total investments spent on equipment (*Equip*), R&D (*R&D*) and advertising (*Advert*). Finally, the dependent variables for hypothesis H4 are the absolute value of total accounting adjustments expressed as a percentage of total adjustment limit (*TotalAc*), the total increase in accounting adjustments as a percentage of the limit for increase in provisions (*IncAc*) and the total decrease in accounting adjustments as a percentage of the limit for decreases in provisions (*DcrAc*). Note that an increase in accounting adjustments will lead to a decline in earnings for the period, while a decrease in accounting adjustments will lead to an increase in earnings for the period. For each of the dependent variables mentioned in this section, the parameters in equation 6.1 are used to compute the cell means. The computation is presented in Table 6.1.

TABLE 6.1 Cell mean parameters for the six foresight × discretion groups

	Cell mean parameters	
Accounting Discretion	*Low foresight*	*High foresight*
Low	θ_1	$\theta_1+\alpha_1$
Moderate	$\theta_1+\beta_1$	$\theta_1+\alpha_1+\beta_1+\gamma_1$
High	$\theta_1+\beta_2$	$\theta_1+\alpha_1+\beta_2+\gamma_2$

6.3 RESULTS ON REPORTING OF SMOOTH INCREASING EARNINGS

6.3.1 Test of Hypothesis H1

Hypothesis H1 states that a reduction in accounting discretion brings about a separation in the earnings series reported by high and low foresight managers. The hypothesis therefore predicts that both interaction terms, *ForeMod* and *ForeHigh*, are negative. To demonstrate this, the interaction terms are analysed as follows (Jobson [1991]):

$$\text{Coefficient for } \textit{ForeMod} = (\text{High foresight} - \text{Low foresight})_{\text{Moderate discretion}} - (\text{High foresight} - \text{Low foresight})_{\text{Low discretion}} \quad (6.2)$$

$$\text{Coefficient for } \textit{ForeHigh} = (\text{High foresight} - \text{Low foresight})_{\text{High discretion}} - (\text{High foresight} - \text{Low foresight})_{\text{Low discretion}} \quad (6.3)$$

$$\text{Coefficient for } \textit{ForeHigh} - \text{Coefficient for } \textit{ForeMod} = (\text{High foresight} - \text{Low foresight})_{\text{High discretion}} - (\text{High foresight} - \text{Low foresight})_{\text{Moderate discretion}} \quad (6.4)$$

Equation 6.2 shows that the coefficient for *ForeMod* can be written as the difference in scores between the two types of foresight managers in a moderate discretion environment compared to that in a low discretion environment. Similarly, the coefficient for *ForeHigh* compares the difference in scores for both types of managers in a high

discretion and that for the low discretion environment. Lastly, a comparison of the two coefficients, *ForeHigh* and *ForeMod*, shows the difference in scores for both types of managers in a high discretion and in a moderate discretion environment.

According to hypothesis H1, if reducing discretion successfully separates the two earnings series reported by high foresight and low foresight managers, one would expect that the difference in scores between the two groups will be higher in a low discretion condition than in a moderate or high discretion condition. This translates into negative coefficients for both *ForeMod* and *ForeHigh*. The coefficient of *ForeHigh* is also expected to be more negative than that of *ForeMod* to indicate that a greater reduction in discretion would lead to a greater separation in scores.

Figure 6.1 provides a graph of the cell means reported in Table 5.1, panel B in Chapter 5. The graph shows an interaction between accounting discretion and foresight. When there is a high level of accounting discretion, the scores of the two types of managers are close to each other. However, as discretion is reduced, the difference between the two scores increases. The largest difference in scores occurs at a low level of discretion.

Table 6.2 presents the results for the test of hypotheses H1 to H4. Panel A in Table 6.2 shows the results for the test of hypothesis H1. The coefficients for the interaction terms, *ForeMod* and *ForeHigh* are both negative. Using a one-tailed test, the coefficients for *ForeMod* and *ForeHigh* are significantly different from zero (p-value = 0.036 and 0.010 respectively). The joint interaction effect is marginally significant; the F-statistic with 2 and 94 degrees of freedom is 2.96 has a p-value of 0.057. Panel A also shows that the coefficient for *ForeHigh* is more negative than that for *ForeMod*. The two coefficients

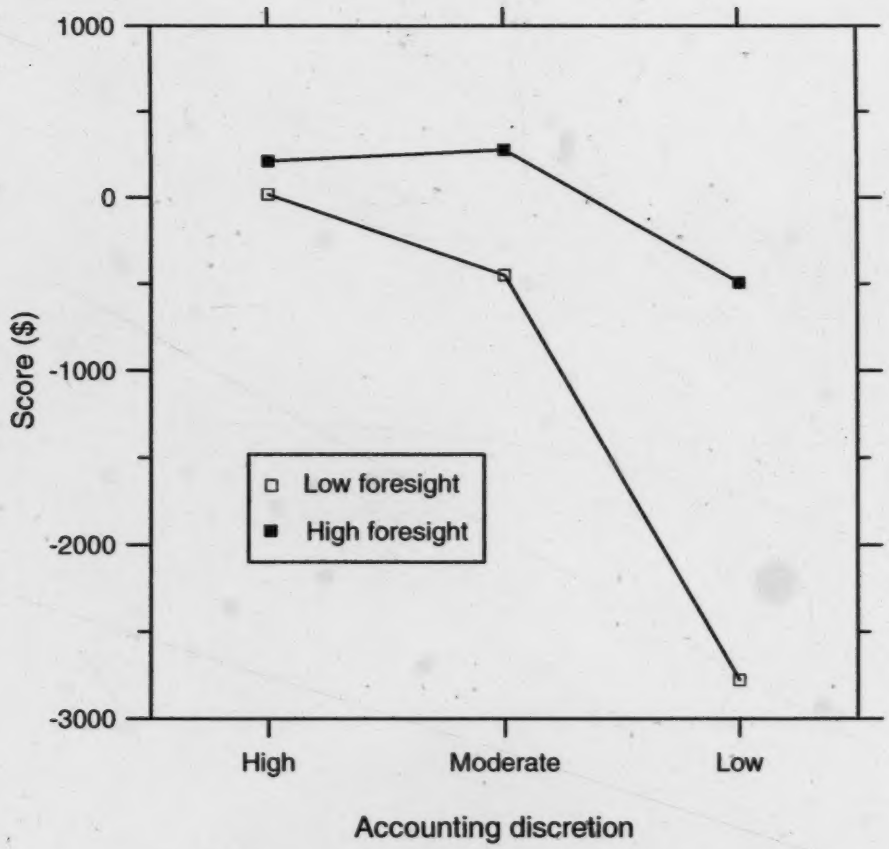


FIGURE 6.1 Cell mean scores at the end of period 12

for the interaction terms, however, are not significantly different from each other (p-value = 0.517). These results indicate support for hypothesis H1 provided that the accounting discretion is reduced to a low level (less than 10% of operating earnings). A reduction from high discretion to moderate discretion, however, does not lead to a significant separation in the scores. Similar results are also observed when the White correction for heteroscedasticity (White [1980]) is used to obtain heteroscedasticity-consistent estimators for equation 6.1.

TABLE 6.2 Results of tests of hypotheses H1 to H4

Basic model:

$$DV_i = \theta_1 + \alpha_1 Fore_i + \beta_1 Mod_i + \beta_2 High_i + \gamma_1 ForeMod_i + \gamma_2 ForeHigh_i + e_i$$

where 'Fore' is a dummy variable with '1' representing high foresight, and '0' representing low foresight. Accounting discretion is divided into three categories, low discretion (<10%), moderate discretion (10-15%), and high discretion (16-20%). 'Mod' is the dummy variable for moderate discretion, and 'High' is the dummy variable for high discretion. The interaction terms are ForeMod = Fore × Mod, and ForeHigh = Fore × High. DV is the dependent variable specified in the first column of each panel and e_i is the random error.

Note: *p*-values for a one-tailed test for each of the coefficients in the regression are in parentheses.

Panel A: Individual regression with score at the end of period 12 (Score12)

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 *(Adj* R^2*)*
Score12	–2776.91	2284.78	2327.35	2795.28	-1558.79	-2091.02	0.227
	(<0.0001)	(0.001)	(0.000)	(<0.0001)	(0.036)	(0.010)	(0.186)

Panel B: Individual regression with percentage invested in equipment (Equip), percentage invested in R&D (R&D) and percentage invested in advertising (Advert) as dependent variables

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 *(Adj* R^2*)*
Equip	0.559	-0.116	-0.021	0.073	0.127	0.015	0.046
	(<.0001)	(0.119)	(0.410)	(0.236)	(0.161)	(0.456)	(-0.005)
R&D	-0.206	-0.098	0.009	-0.043	0.114	0.180	0.086
	(<0.001)	(0.056)	(0.438)	(0.248)	(0.079)	(0.016)	(0.037)
Advert	0.235	0.214	0.012	-0.030	-0.241	-0.195	0.135
	(0.001)	(0.007)	(0.441)	(0.368)	(0.016)	(0.047)	(0.090)

TABLE 6.2 (continued) Results on tests of hypotheses H1 to H4

Panel C: Test of effect of a reduction of discretion on high foresight managers

	Effect Tested		
Dependent Variable	*From high to low discretion* ($\beta_2 + \gamma_2 = 0$)	*From high to moderate discretion* ($\beta_2 + \gamma_2 - \beta_1 - \gamma_1 = 0$)	*From moderate to low discretion* ($\beta_1 + \gamma_1 = 0$)
Hypothesis H2			
Equip	0.088	-0.018	0.106
	(0.152)	(0.420)	(0.119)
R&D	0.137	0.014	0.123
	(0.006)	(0.402)	(0.015)
Advert	-0.225	0.004	-0.229
	(0.002)	(0.479)	(0.002)
Hypothesis H3			
Score12	704.26	-64.30	768.56
	(0.110)	(0.457)	(0.101)

Panel D: Individual regression with total accounting adjustments (TotalAc) as the dependent variable; and multivariate regression with decrease in accounting adjustments (DcrAc), and increase in accounting adjustments (IncAc) as the dependent variables. (All dependent variables are expressed as a percentage of the total amount of provisions allowed.)

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
TotalAc	0.320	0.071	0.005	– 0.040	-0.099	– 0.035	0.080
	(<0.0001)	(0.064)	(0.453)	(0.204)	(0.051)	(0.287)	(0.031)
IncAc	0.316	0.242	-0.022	-0.034	-0.163	-0.111	0.148
	(<0.0001)	(0.005)	(0.400)	(0.361)	(0.088)	(0.186)	(0.103)
DcrAc	0.326	-0.186	0.045	-0.048	-0.003	0.079	0.209
	(<0.0001)	(0.005)	(0.248)	(0.259)	(0.487)	(0.207)	(0.167)

6.3.2 Test of Hypothesis H2

Hypothesis H2 states that a reduction in accounting discretion motivates high foresight managers to reduce investments in assets with variable returns, and to increase investments in assets with less variable returns, in order to report smooth increasing earnings. H2 also states that low foresight managers are less able to make these

operational adjustments. Recall from Chapter 4 that the investment assets available to managers generate earnings with differing levels and variability. Given that R&D generates more variable earnings than either equipment and advertising, H2 predicts that high foresight managers would spend less on R&D and more on equipment and advertising when accounting discretion is reduced. Low foresight managers, in contrast, are not expected to alter their investments significantly when discretion changes. Therefore, the coefficients for *Mod* and *High* are predicted not to be significantly different from zero in all three regressions. The interaction terms, *ForeMod* and *ForeHigh*, are predicted to be positive for the *R&D* regression but negative for the *Equip* and *Advert* regressions to indicate that compared to low foresight managers, high foresight managers will increase expenditures in R&D and reduce expenditures in equipment and advertising when discretion increases.

Plots of the mean percentage investment in each type of asset at different levels of discretion are given in Figure 6.2. Figure 6.2a shows that both types of managers invest slightly more in equipment when accounting discretion increases. Figure 6.2b shows that as discretion increases, high foresight managers spend a higher percentage of their investments on R&D. Figure 6.2c shows that low foresight managers allocate almost the same percentage of investment to advertising regardless of the level of accounting discretion. In contrast, high foresight managers spend more on advertising when discretion is low.

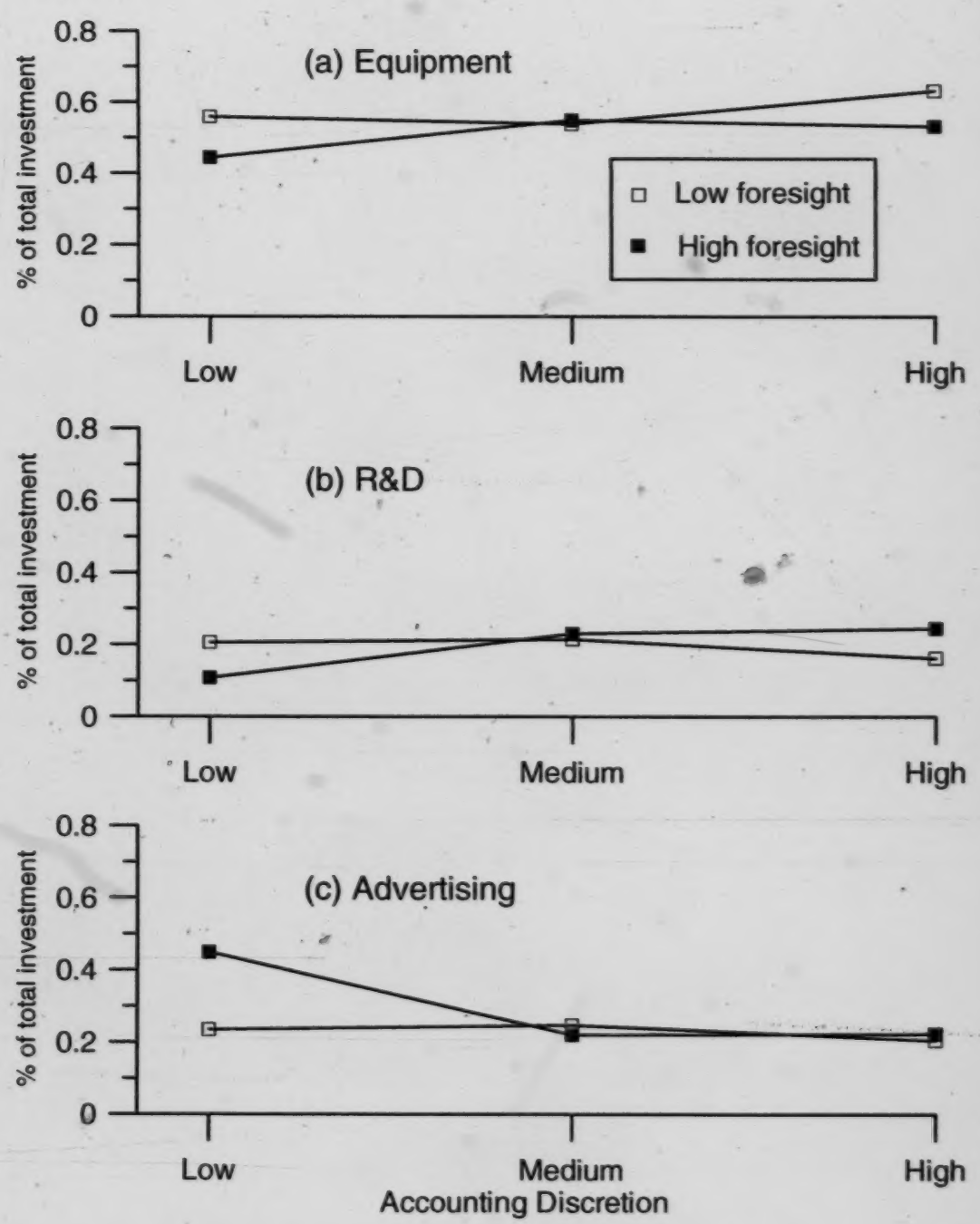


FIGURE 6.2 Mean percentage investment in equipment, R&D and advertising for high and low foresight managers

The percentages of total investment spent on equipment, R&D and advertising are separately regressed on the independent variables listed in equation 6.1. The results are presented in panel B of Table 6.2. None of the coefficients for *Mod* and *High* is significant. The level of discretion does not affect a low foresight manager's investment in any of the assets. The predictions in hypothesis H2 regarding the investments by low foresight managers are therefore supported.

Panel C in Table 6.2 provides the results of the effect of a reduction in discretion on investments by high foresight managers. Three situations are tested: (1) from high to low discretion, (2) from high to moderate discretion, and (3) from moderate to low discretion. A high foresight manager's investment in equipment is not affected by the level of discretion. The *p*-values for all three tests are insignificant. In contrast, giving a low level of discretion to high foresight managers leads to a significant reduction in investments in R&D (*p*-value = 0.006), and a significant increase in investment in advertising (*p*-value = 0.002).

The interaction terms in panel B of Table 6.2 show the relative effect of accounting discretion on investments by the two types of managers. For R&D, the interaction between foresight and high discretion is positive and significant (*p*-value = 0.016). The coefficient for *ForeMod* in the *R&D* regression is, however, not significant (*p*-value = 0.079). For advertising, the interaction terms, *ForeMod* and *ForeHigh,* are both negative and significant (*p*-value =0.016 and 0.047 respectively). Compared to low foresight managers, high foresight managers spend more on advertising when accounting discretion is low than when it is high (or moderate). None of the interaction terms in the equipment regression is significant. The results on the high foresight managers provide

partial support for hypothesis H2 because these managers do not significantly increase their investments in equipment relative to those by low foresight managers when discretion is reduced. In addition, high foresight managers do not increase their R&D expenditures relative to low foresight managers when discretion is moderate.

6.3.3 Test of Hypothesis H3

Hypothesis H3 states that a reduction in accounting discretion has a smaller effect on a high foresight manager's ability to report smooth increasing earnings than on a low foresight manager. The hypothesis predicts that the coefficients for the two accounting discretion variables (*Mod* and *High*) in equation 6.1 are positive, and that the coefficient for *High* is greater than the coefficient for *Mod*.

Panel A in Table 6.2 shows that both coefficients are greater than zero and are significant (p-value = 0.000 in both cases). The mean scores for the high and moderate discretion groups are significantly higher than that for the low discretion group. These results show that a reduction in accounting discretion makes it more difficult for low foresight managers to report smooth increasing earnings. The equality of the two coefficients for *Mod* and *High* is also investigated. The null hypothesis of equality is not rejected (F-statistic with 1 and 94 degrees of freedom is 0.690, p-value = 0.410). These results indicate that a reduction from high to moderate levels of accounting discretion does not affect low foresight managers significantly. Their reporting ability is significantly affected only when there is a low level of accounting discretion.

Hypothesis H3 also predicts that a reduction in accounting discretion has a smaller effect on the ability of high foresight managers to report smooth increasing earnings. A

test of the overall effect of discretion on high foresight managers (that is, $\beta_2 + \gamma_2 = \beta_1 + \gamma_1 = 0$) indicates that the effect is insignificant (p-value = 0.347). Three situations in which discretion can be reduced are also investigated (1) from high to low discretion, (2) from high to moderate discretion, and (3) from moderate to low discretion. The respective tests of parameters in equation 6.1 are: $\beta_2 + \gamma_2 = 0$, $\beta_2 + \gamma_2 - \beta_1 - \gamma_1 = 0$, and $\beta_1 + \gamma_1 = 0$. Panel C in Table 6.2 presents the results. As expected, none of the F-statistics for the individual tests is significant, given the lack of significance in the overall effect of discretion. In conclusion, the results show that hypothesis H3 cannot be rejected.

6.3.4 Test of Hypothesis H4

Hypothesis H4 states that high foresight managers use fewer accounting adjustments than low foresight managers to achieve their reporting objective in a low discretion environment. The results for the test of hypothesis H4 are presented in panel D of Table 6.2. In the experiment, a manager can adjust accounting provisions either upwards or downwards in order to report smooth increasing earnings. An upward adjustment of accounting provisions will result in a decline in earnings for the current period; a downward adjustment in accounting provisions will increase earnings for the current period. The overall use of accounting discretion is therefore calculated as the sum of the absolute value of both types of adjustments, expressed as a percentage of total accounting adjustments allowed. This percentage is used as a dependent variable and regressed on independent variables given in equation 6.1. The *Fore* coefficient is predicted to be negative to indicate a low usage of accounting adjustments by high foresight managers in a low discretion environment. The first equation in Panel D in Table 6.2 shows that the

coefficient for *Fore* is not significant. The accounting adjustments used by both types of managers are therefore not significantly different. These results do not provide support for hypothesis H4.

To further analyse the effect of foresight on the type of accounting adjustments used by managers, the second and third regressions in panel D of Table 6.2 are evaluated in a multivariate setting, where the increase and decrease in provisions are separate dependent variables in the multivariate regression. The two dependent variables are expressed as a percentage of their respective total amount of provisions allowed. In contrast to the results from first regression in panel D, the coefficient for *Fore* is significantly different from zero in the multivariate regression. The Wilk's lambda for this test is 0.913 and its F-statistic is 4.42, with 2 and 93 degrees of freedom (p-value = 0.015). The hypothesis that the *Fore* coefficients in both equations are equal is also rejected (p-value = 0.004). An examination of the individual regressions indicates that the *Fore* coefficient is negative when a decrease in provision is used as the dependent variable, and is positive when an increase in provisions is used as a dependent variable. Compared to low foresight managers in a low discretion environment, high foresight managers use significantly fewer provisions that increase earnings, but they use more provisions that decrease earnings.

When making accounting adjustments, participants in the experiment have a choice of three types of adjustments (bad debts, restructuring benefits, and retirement benefits) which have different levels of reversal. The adjustments can be used to increase or decrease earnings in that particular period. Table 6.3 provides the results on how foresight affects the use of these accounting adjustments by managers. Panel A presents

the results for adjustments that are used to decrease earnings, and panel B presents the results for adjustments that are used to increase earnings.

TABLE 6.3 Comparison of types of accounting adjustments used by high and low foresight managers

Individual regression with increase in bad debts (IncBd), increase in restructuring benefits (IncRest), increase in retirement benefits (IncRet), decrease in bad debts (DcrBd), decrease in restructuring benefits (DcrRest), and decrease in retirement benefits (DcrRest) as dependent variables.
(All dependent variables are expressed as a percentage of the total amount of provisions allowed.)
Note: *p*-values for one-tailed test of each of the coefficients in the regression are in parentheses

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
Panel A: Adjustments that are used to decrease earnings							
IncBd	0.096	0.233	-0.007	0.010	-0.134	-0.155	0.168
	(0.053)	(0.002)	(0.460)	(0.448)	(0.089)	(0.067)	(0.124)
IncRest	0.080	0.018	0.017	-0.021	0.049	0.002	0.021
	(0.006)	(0.328)	(0.326)	(0.308)	(0.175)	(0.485)	(-0.031)
IncRet	0.141	-0.009	-0.032	-0.024	0.020	0.042	0.007
	(0.006)	(0.448)	(0.316)	(0.374)	(0.416)	(0.331)	(-0.046)
Panel B: Adjustments that are used to increase earnings							
DcrBd	0.131	-0.062	0.000	-0.013	-0.005	-0.003	0.054
	(0.002)	(0.136)	(0.499)	(0.413)	(0.471)	(0.484)	(0.004)
DcrRest	0.080	-0.044	0.020	0.006	0.001	0.027	0.050
	(0.004)	(0.126)	(0.291)	(0.442)	(0.491)	(0.300)	(-0.0003)
DcrRet	0.114	-0.081	0.026	-0.041	0.001	0.055	0.138
	(0.001)	(0.025)	(0.249)	(0.168)	(0.492)	(0.159)	(0.092)

Panel A in Table 6.3 shows that high foresight managers use significantly more bad debts than low foresight managers (*p*-value = 0.002) when adjusting earnings downwards in a low discretion environment. The use of restructuring expenses and retirement benefits is not significantly different for the two foresight groups (*p*-value = 0.328 and 0.448 respectively). Panel B in Table 6.3 shows that low foresight managers make

significantly more adjustments to retirement benefits than high foresight managers when adjusting earnings upwards (p-value = 0.025) in a low discretion environment. None of the other types of adjustments is significantly different between the two groups of managers (p-value = 0.136 for bad debts and 0.126 for restructuring benefits).

6.4 DISCUSSION

6.4.1 Separation in earnings reported by managers

The results from this experiment show that a significant restriction in accounting discretion prevents low foresight managers from manipulating earnings. However, at high levels of discretion, low foresight managers are able to report smooth increasing earnings that are similar to those of high foresight managers.

An implication of the above results is that in a low discretion environment, investors can use patterns of smooth increasing earnings to distinguish between managers who have information about future earnings and those who have limited information. The knowledge that low foresight managers are unable to report smooth earnings in a low discretion environment provides investors with the confidence that the smooth increasing earnings patterns are likely to be generated by high foresight managers and that such earnings can be relied upon for investment decisions. Firms that report a pattern of smooth increasing earnings are valuable to investors because a high level of earnings indicates the permanence of cash flows (Kirschenheiter and Melumad [2002]), while the smoothness of earnings indicates the stability and predictability of future earnings (Ronen and Sadan [1981]). Smooth earnings are also a reflection of earnings quality, which is

defined as reported earnings that are close to economic earnings (Kirschenheiter and Melumad [2002]).

6.4.2 Interaction between operating and accounting choices

Analysis of the experimental results indicate that high foresight managers alter their operational strategies in response to the available level of accounting discretion in order to achieve their reporting objective. In contrast, accounting discretion has an insignificant impact on the operational strategies of low foresight managers. High foresight managers decrease their investment in R&D when accounting discretion is low, but increase their investment in R&D when accounting discretion is high. These results are similar to those reported in Perry and Grinaker [1994], and Baber et al. [1991] which show that managers adjust their investments in R&D in order to achieve their earnings objective. The adjustment of advertising expenditures to achieve the earnings target documented in this study is also reported in Kasznik [1999].

The results also show that high foresight managers do not make significant increases in their investments in equipment when accounting discretion is reduced even though equipment provides stable earnings over time; instead, the managers prefer to increase their short-term investments (advertising). The study by Barton and Simko [2002] provides insight into why this pattern of investment might occur. Barton and Simko [2002] show that previous actions by managers to manipulate discretionary accruals constrain their ability to manipulate future earnings because accruals reverse over time. Using the same reasoning, when managers make short-term investments instead of long-

term investments, they can reduce the impact of past decisions on current earnings, and this enables them to better cope with a reduction in discretion.

The lack of operational response by low foresight managers to a reduction in discretion provides an explanation as to why a reduction in discretion has a more significant negative effect on low foresight managers than on high foresight managers (sections 6.3.1 and 6.4.1). High foresight managers respond to a decline in accounting discretion by adjusting their investment strategies, but low foresight managers do not make significant changes. The latter have limited knowledge about expected earnings from the investments, which makes it more difficult for them to use operational smoothing. Instead, low foresight managers have to rely on accounting discretion for the smoothing. A restriction in accounting discretion combined with a lower ability to make operational changes therefore makes it difficult for low foresight managers to achieve their smoothing objective.

To determine the approximate cost of not actively using operational strategies to cope with a reduction in discretion, the ratio of standard deviation to mean of earnings change is computed for the two groups of managers. The data used to compute this ratio are the mean and standard deviation of earnings before accounting adjustments (Note that Table 5.1, panel B presents the data for earnings after accounting adjustments). When there is high discretion, the ratio of standard deviation to mean is approximately the same for both groups of managers (1.29 for low foresight and 1.23 for high foresight). However, when discretion is reduced, the ratio is 1.99 and 1.24 for low and high foresight managers respectively. By making fewer changes to their operational strategies, low foresight

managers experience an increase of $0.70 in standard deviation per dollar of mean earnings change, compared to only $0.01 for high foresight managers.

The results on the operational response by high foresight managers may lead one to conclude that high foresight managers, who reduce their investments in assets with high but variable earnings in a low discretion environment, are making sub-optimal investments compared to low foresight managers who do not make such changes in investments. One might also conclude that high foresight managers are more 'opportunistic' than low foresight managers because the former are able to switch among different types of investments to achieve their objective. The discussion that follows shows why these two conclusions are incorrect.

In a low discretion environment, high foresight managers invest in assets with stable returns rather than those with more variable returns. Although these investments also result in lower earnings for high foresight managers, their action is appropriate because the lower variability in earnings from these assets reduces the managers' reliance on accounting adjustments. An alternative perspective is that high foresight managers have traded in higher returns for lower variability in earnings in order to achieve their reporting objective. Therefore making adjustments to their investment portfolio enables the high foresight managers to achieve smooth patterns of earnings despite the low discretion. Several studies reviewed in Chapter 2 show that smooth earnings are desired by investors, and managers can maximise their firm's value by reporting such earnings. Consequently, the ability to switch among investments should not be misconstrued as an opportunistic act by high foresight managers. It should be regarded as an appropriate and prudent response by high foresight managers to changes in discretion levels in order to

achieve their smoothing objective that will ultimately lead to an increase in the firm's value.

In the high discretion environment, low foresight managers can create a semblance of stability in reported earnings by using accounting adjustments to offset the operational variability generated from their investments; in a low discretion environment, this reliance on discretion is no longer possible. By not switching to assets with more stable earnings in a low discretion environment, low foresight managers are less likely to be able to achieve their reporting objective. Therefore, investing in the same portfolio of investments regardless of the level of discretion is not an optimal strategy for low foresight managers.

One of the arguments against a reduction in accounting discretion is that it hampers a manager's ability to communicate with shareholders (Dye and Verrecchia [1995], Healy and Palepu [1993], Watts and Zimmerman [1986]). The results on the interaction between accounting discretion and operational variables indicate that when managers have the capacity to use smoothing tools other than accounting techniques, a restriction in accounting discretion does not necessarily lead to a reduction in a manager's ability to communicate with shareholders. However, achieving smooth earnings by adjusting investments is costly because managers have to forgo investments with higher earnings such as R&D in favour of short-term investments which have more stable but lower earnings. A reduction of R&D to meet a short-term earnings target, for instance, can lower the long-term earning potential of a firm (Mande et al. 2000, Baber et al. 1991, Horwitz and Kolodny 1980). Given that R&D is important for the long-term survival of

firms operating in a competitive environment, a reduction in accounting discretion may be undesirable from this perspective.

6.4.3 Percentage of accounting adjustments

Contrary to the predictions in Demski [1998], and Lilien et al. [1988], the analysis in this thesis shows that accounting adjustments play an important role in enabling high foresight managers to achieve their smoothing objectives. The thesis shows that the total accounting adjustments used by high foresight and low foresight managers are not significantly different. These findings therefore provide support to Dye and Verrecchia [1995] who argue that accounting discretion is needed by managers to communicate information about economic earnings to shareholders.

Several archival studies (e.g. Nelson et al. [2002b], Kasznik [1999], Burgstahler and Dichev [1997], Lilien et al. [1988]) report that managers tend to use more income-increasing adjustments when managing earnings. The results in this thesis additionally show that managers who have limited foresight use more income-increasing adjustments than high foresight managers when smoothing earnings. High foresight managers, in contrast, make more income-decreasing adjustments than low foresight managers. These results imply that high foresight managers are able to generate higher than expected earnings compared to low foresight managers. This finding is expected given the former's superior knowledge about their operations.

Further analysis of the type of accounting adjustments used by managers shows that low foresight managers use significantly more accounting adjustments with long reversal periods than high foresight managers when managing earnings upwards. Since low

foresight managers have a limited ability to smooth earnings with investments and have to rely on accounting discretion to smooth earnings, using adjustments that have long reversal periods ensures that the reversals will have a smaller dampening effect on future earnings. When managing earnings downwards, high foresight managers tend to use more short term adjustments (bad debts) than low foresight managers. The reversals of income-decreasing adjustments would lead to an increase in future earnings. Additional future earnings are likely to be welcomed by these managers because their objective is to generate increasing earnings in addition to smooth earnings. Hence, there is a lower need to spread the reversals over a longer period.

In archival studies, the extent of earnings management is normally measured by the level of total discretionary accruals, which is usually estimated from models such as the Jones' model (Jones [1991]) or the modified Jones' model (Dechow et al. [1995]). Dechow et al. [1995] find that most estimation models for total discretionary accruals lack power in detecting opportunistic earnings management. Opportunistic earnings management occurs when managers alter financial reports to mislead stakeholders about the underlying economic performance of the firm (Healy and Wahlen [1999]). In the thesis, low foresight managers have limited knowledge about future earnings to smooth earnings properly but they attempt to generate smooth earnings nonetheless. These managers can therefore be regarded as behaving opportunistically, according to Healy and Wahlen's definition. This thesis shows that there is no significant difference in the total discretionary accruals used by these low foresight managers and high foresight managers, who have information to smooth earnings. The lack of difference in the discretionary accruals may perhaps explain why existing discretionary accrual models

show little success in detecting whether opportunism exists in a manager's earnings management attempt.

At present, the estimation models used to detect earnings management do not make distinctions between discretionary accruals used for informative or opportunistic earnings management purposes (Kothari [2001], Fields et al. [2001]). These models have been used to investigate the existence of both types of earnings management (e.g Subramanyam [1996], Dechow et al. [1995]). Subramanyam [1996] finds that, on average, discretionary accruals are priced by capital markets. Assuming market efficiency, Subramanyam concludes that discretionary accruals communicate information about the future profitability of the firm. In contrast, Jones [1991] and others show that managers use discretionary accruals to manipulate earnings to mislead regulators, debt-holders and stock markets. Due to these conflicting findings on the desirability of discretionary accruals, several researchers have highlighted the need to include management incentives in models of discretionary accruals (Kothari [2001], Guay et al. [1996]). Given that a manager's incentive is not publicly observed, the results in this thesis suggest that in addition to patterns of earnings, a manager's choice of the discretionary accruals may be used to provide information on the managerial type. This thesis shows that the type of adjustment used by two groups of managers differs in terms of its effect on current and future earnings. An earlier study by McNichols and Wilson [1988] also argues for the need to analyse individual discretionary accruals instead of total discretionary accruals in order to more accurately detect earnings management by firms. Given the large number of accruals available to managers, future research may

wish to examine how parsimonious models of individual discretionary accruals can be developed to detect the managerial type.

7 SENSITIVITY ANALYSIS

7.1 INTRODUCTION

This chapter presents the results of four sets of sensitivity analyses. The sensitivity analyses are required to ensure that the results presented in Chapter 6 are not driven by one's choice of measurement of the dependent variable and independent variables. The first set of analyses tests for normality of the dependent variables used in Chapter 6, and examines its effect on the results reported in Chapter 6. The second set of analyses (Section 7.3) examines the effect of modifications to the following estimating equation, which is used in Chapter 6 to test hypotheses H1 to H4.

$$Score12_i = \theta_1 + \alpha_1 Fore_i + \beta_1 Mod_i + \beta_2 High_i + \gamma_1 ForeMod_i + \gamma_2 ForeHigh_i + \varepsilon_i \quad (7.1)$$

The modifications include (1) the use of a score at a period other than period 12 as the dependent variable, (2) the use of different partitions for accounting discretion, (3) the use of accounting discretion as a continuous variable instead of a categorical variable, (4) the addition of experience of managers, listing status, and industry variability as covariates, and (5) the use of effect coding instead of dummy coding for the indicator variables in equation 7.1.

The third set of sensitivity analyses (Section 7.4) examines the effect of discretion and foresight on alternative measures of earnings performance. The alternative measures include (1) the standard deviation of reported earnings, (2) ranks of *Score12*, and (3) an adaptation of the coefficient of variation measure discussed in Chapter 4, that is, *Mn/StdDev* and its logarithmic transformation [ln*(Mn)* – ln*(StdDev)*]. This section also

uses canonical correlation analysis to examine the relative effect of accounting discretion, foresight and their interaction on individual components of the score. The last set of analysis (Section 7.5) uses logistic regression to examine the effect of discretion and foresight on the likelihood that a manager obtains a particular level of score. A discussion of the four sets of sensitivity results is provided in Section 7.6.

7.2 TEST OF NORMALITY

Table 7.1 provides the results on the test of normality of the dependent variables in the regressions presented in Chapter 6. The *p*-values in the table are associated with the *Kolmogorov-Smirnov* statistic. The skewness and the kurtosis of the distributions are also presented in the table. The normality assumption is satisfied for *Equip*, *TotalAc*, and *DcrAc*. *Score12* is not normally distributed. Its two components, *Mn* and *StdDev* are also not normally distributed. High kurtosis is obtained in the distributions for *Score12*, *Mn* and *StdDev*.

TABLE 7.1 Results of test of normality of dependent variables used in Chapter 6

Dependent Variable	*Skewness*	*Kurtosis*	*Kolmogorov-Smirnov statistic*	*p-value*
Score12	-2.446	9.599	0.174	<0.01
Mn	1.706	4.785	0.119	<0.01
StdDev	2.977	12.691	0.179	<0.01
Equip	-0.360	-0.879	0.080	0.109
R&D	1.269	1.510	0.139	<0.01
Advert	1.423	1.705	0.139	<0.01
TotalAc	-0.121	0.412	0.072	>0.15
DcrAc	0.354	-0.758	0.072	>0.15
IncAc	0.648	-0.479	0.107	<0.01

A problem with the non-normality of the dependent variables is that any inference based on *t*-statistics and *F*-statistics generated from ordinary least squares regression may be misleading. One possibility is to transform the variables such that normality of the transformed variables can be achieved (Jobson [1991]). Another possibility is to continue using ordinary least squares regression but to deal with the problem of inference by the method of bootstrapping the *t*-statistics (Johnston and DiNardo [1997], Efron and Tibshirani [1986]).

The usual method of transforming a variable to achieve normality is to take logarithms of the original variables (Jobson [1991]). However, the original variables must not contain non-positive values in order for a logarithmic transformation to be possible. All the dependent variables listed in Table 7.1, except for *Mn* and *StdDev*, contain some non-positive values. Consequently, the logarithmic transformation for the dependent variables containing non-positive values is not carried out. Instead the bootstrap procedure is adopted to determine the empirical distribution of the *t*-ratios for each of the coefficients in the regressions affected by non-normality of the dependent variables. The *t*-ratios computed in the original regression are then compared to the bootstrapped distribution of *t*-ratios to determine the significance of the original *t*-ratios.

The bootstrapping of *t*-ratios, which is discussed in Johnston and DiNardo [1997], is used in this section. Essentially the bootstrap method involves obtaining the residuals in the original regression and resampling of the residuals with replacement to form a new dependent variable. This new dependent variable is the sum of residual and the predicted value of the dependent variable obtained from the original regression. The new dependent variable is then regressed on the original set of independent variables and the *t*-ratios of

the coefficients are obtained. This procedure is repeated one thousand times and the set of *t*-ratios generated for each coefficient is used to form the empirical distributions. The original *t*-ratio is compared to the 95% confidence interval in this distribution. If the original *t*-ratio falls outside this confidence interval, the original *t*-ratio is not suitable for inference. The bootstrap program supplied in the Shazam manual (White et al. [1997]) is adapted for the analysis in this section.

The results of the bootstrap procedure for the four dependent variables that do not meet the normality requirements are presented in Table 7.2. The table shows the *t*-ratios obtained from the original regression, and the mean and standard deviation of the bootstrapped distribution of *t*-ratios. None of the original *t*-ratios falls outside the 95% confidence level of its respective bootstrapped distribution. In nearly all cases, the original *t*-ratio is close to the mean of the empirical *t* distribution. Only the *t*-ratio for *High* in the R&D regression is slightly more than one standard deviation away from its mean. The *t*-ratios in the original regression can therefore be relied upon for inference.

TABLE 7.2 Results of bootstrapping of *t*-ratios in selected regressions

Dependent variable		*Intercept*	*Fore*	*Mod*	*High*	*ForeMod*	*ForeHigh*
Score12	Original *t*-ratio	-5.468	3.506	3.819	4.119	-1.828	-2.360
	Mean	-5.567	3.556	3.898	4.208	-1.850	-2.414
	Standard deviation	1.121	1.114	1.150	1.134	1.075	1.071
R&D	Original *t*-ratio	4.293	-1.564	0.163	0.655	1.401	2.125
	Mean	4.259	-1.514	0.218	-0.599	1.379	2.068
	Standard deviation	1.029	1.020	1.045	1.050	1.037	0.998
Advert	Original *t*-ratio	3.574	2.517	0.128	-0.346	-2.167	-1.697
	Mean	3.578	2.541	0.111	-0.360	-2.142	-1.679
	Standard deviation	1.037	1.071	1.040	1.043	1.027	1.034
DcrAc	Original *t*-ratio	5.887	-2.630	0.684	-0.625	-0.031	0.825
	Mean	5.878	-2.659	0.701	-0.596	0.026	0.835
	Standard deviation	1.064	1.046	1.024	0.996	1.027	0.994

7.3 MODIFICATIONS TO MAIN ESTIMATING EQUATION

7.3.1 Scores at 4th and 8th periods as dependent variables

Equation 7.1 is re-estimated using the scores at duration 4 (*Score4*) and duration 8 (*Score8*) as dependent variables. Table 7.3 presents the results for *Score4*, *Score8* and *Score12*. The table shows that the results for *Score4* and *Score8* are similar to those for *Score12* (results from panel A of Table 6.1 are reproduced here). The coefficients for both *ForeMod* and *ForeHigh* are also significant in these regressions. Multivariate regression for the three dependent variables is also performed to test whether the coefficients for each independent variable are equal across all three equations. The results are presented in Table 7.3. Except for the *Fore* coefficients, none of the *p*-values associated with the Wilks' lambda is significant. The *Fore* coefficient is lower in the *Score4* regression than in the other two regressions. Nevertheless, the coefficient is

significant in the *Score4* regression. The rest of the independent variables have coefficients that are not significantly different across regressions.

TABLE 7.3 Results of individual regression with score at duration 4 (*Score4*), duration 8 (*Score8*) and duration 12 (*Score12*) as dependent variables

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
Score4	–649.06	1688.04	2637.29	1736.68	-3116.96	-2513.02	0.223
	(0.086)	(0.003)	(<0.0001)	(0.004)	(0.000)	(0.002)	(0.182)
Score8	–3240.18	3407.41	2675.06	3211.93	-2228.66	-3066.26	0.240
	(<0.0001)	(<0.0001)	(0.000)	(0.000)	(0.016)	(0.003)	(0.200)
Score12	–2776.91	2284.78	2327.35	2795.28	-1558.79	-2091.02	0.227
	(<0.0001)	(0.001)	(0.000)	(<0.0001)	(0.036)	(0.010)	(0.186)
Wilks' lambda		0.907	0.989	0.969	0.962	0.962	
F-statistic		4.77	0.53	1.47	1.86	1.79	
p-value		0.011	0.59	0.235	0.162	0.173	

Note: *p*-values for a one-tailed test of each of the coefficients in the regression are in parentheses

7.3.2 Different partitions for accounting discretion

In Chapter 6, the accounting discretion is categorised into low, moderate and high discretion using the respective partitions: less than 10%, 10-15%, and 16-20%. Given that the experiment used a 5-20% range for discretion levels, dividing the 16 percentages into three discretion categories results in an unequal distribution of percentages to the categories. Five levels of discretion percentages are in each of the low and high discretion categories but six are in the moderate category. To ensure that the results are not driven by the fact that the moderate discretion category has a higher number of percentage levels, in this section, a different partition is used and the equations in Chapter 6 are re-estimated for this new set of discretion partitions. Low discretion is defined to be less

than 10%, moderate discretion (10-14%), and high discretion (15-20%), where participants with a discretion level of 15% are now placed in the high discretion category. The results are presented in Table 7.4.

TABLE 7.4 Regression results using three discretion partitions defined as Low = less than 10%, Moderate = 10-14% and High = 15-20%

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
Score12	-2776.91	2284.78	2240.39	2735.72	-1533.01	-1982.99	0.228
	(<0.001)	(0.001)	(0.001)	(<0.0001)	(0.043)	(0.011)	(0.187)
Equip	0.5591	-0.1156	-0.0087	0.0334	0.1104	0.0589	0.0353
	(<0.0001)	(0.121)	(0.464)	(0.363)	(0.203)	(0.322)	(-0.016)
R&D	0.2060	-0.0981	0.0174	-0.0356	0.1009	0.1754	0.087
	(<0.0001)	(0.056)	(0.386)	(0.275)	(0.113)	(0.015)	(0.039)
Advert	0.2349	0.2137	-0.0087	0.0023	-0.2114	-0.2343	0.133
	(0.001)	(0.007)	(0.459)	(0.490)	(0.034)	(0.018)	(0.087)
TotalAc	0.3203	0.0706	0.0014	-0.0227	-0.0904	-0.0570	0.070
	(<0.0001)	(0.065)	(0.488)	(0.307)	(0.075)	(0.172)	(0.021)
IncAc	0.3164	0.2419	-0.0336	-0.0192	-0.1411	-0.1362	0.147
	(<0.0001)	(0.005)	(0.355)	(0.415)	(0.129)	(0.128)	(0.101)
DcrAc	0.3262	-0.1864	0.054	-0.0280	-0.0144	0.0619	0.205
	(<0.0001)	(0.005)	(0.220)	(0.343)	(0.441)	(0.252)	(0.163)

Note: *p*-values for one tailed test for each of the coefficients in the regression are in parentheses

The results are similar to those presented in Chapter 6. Given that the coefficients for *ForeMod* and *ForeHigh* are both significant, a reduction in discretion results in a separation of the earnings pattern reported by both types of managers. High foresight managers invest in more R&D compared to low foresight managers when there is a higher level of accounting discretion. High foresight managers also invest more in advertising when accounting discretion is reduced. High foresight managers use more income-decreasing adjustments compared to low foresight managers. Similar to the

results in Chapter 6, the absolute amount of adjustments for both groups are not significantly different.

7.3.3 Accounting discretion as a continuous variable

Instead of using accounting discretion as a categorical variable, in this section, accounting discretion is defined as a continuous variable. The estimating equation is given in equation 7.2.

$$DV_i = \beta_1 + \beta_2 Fore_i + \beta_3 Acc_i + \beta_4 ForeAcc + \varepsilon_i \qquad (7.2)$$

where *Fore* is a dummy variable with '1' representing high foresight, and '0' representing low foresight, and *Acc* is the discretion level. *ForeAcc* is the interaction between foresight and accounting discretion. *DV* again represents the dependent variable appropriate to the specific hypotheses. The hypotheses in Chapter 6 are re-evaluated using this new estimating equation.

Table 7.5 presents the regression results for equation 7.2 using each of the following dependent variables: *Score12*, *Equip*, *R&D*, *Advert*, *TotalAc*, *IncAc*, and *DcrAc*. The results for regression 1 in Table 7.5 show that the interaction term, *ForeAcc*, is significantly negative. The equations for the two foresight groups are given by:

Low foresight managers: $\hat{Score12} = -3821.58 + 22797Acc \qquad (7.3)$

High foresight managers: $\hat{Score12} = -659.41 + 5186Acc \qquad (7.4)$

The positive coefficient on *Acc* in equations 7.3 and 7.4 indicates that the availability of accounting discretion assists managers in reporting smooth increasing earnings. Accounting discretion has a greater effect on low foresight managers than on high foresight managers, as evidenced by the higher coefficient on *Acc* for the low foresight

group. The relatively lower intercept in equation 7.3 indicates that reporting of smooth increasing earnings is more difficult for low foresight managers than high foresight managers. By solving the two equations for *Acc*, an accounting discretion level of 17.96% is obtained. At this discretion level, the two groups of managers are able to report the same smooth increasing earnings.

TABLE 7.5 Results of regressions with foresight (*Fore*), accounting discretion (*Acc*) and their interaction (*ForeAcc*) as independent variables

Regression	*Dependent variable & Coefficient*	*Intercept* β_1	*Fore* β_2	*Disc* β_3	*ForeDisc* β_4	R^2 (*Adj.* R^2)
1	*Score12*	-3821.58	3162.17	22797.00	-17611.00	0.175
		(<0.0001)	(0.002)	(0.000)	(0.014)	(0.149)
2	*Equip*	0.5209	-0.1024	0.3677	0.3369	0.028
		(<0.0001)	(0.257)	(0.344)	(0.385)	(-0.003)
3	*R&D*	0.2336	-0.1709	-0.2691	1.3151	0.058
		(0.002)	(0.043)	(0.320)	(0.036)	(0.029)
4	*Advert*	0.2454	0.2733	-0.0985	-1.6521	0.099
		(0.014)	(0.025)	(0.451)	(0.052)	(0.071)
5	*TotalAc*	0.3654	0.0421	-0.4086	-0.1631	0.049
		(<0.0001)	(0.285)	(0.173)	(0.382)	(0.019)
6	*DcrAc*	0.3861	-0.2552	-0.3854	0.6472	0.19
		(<0.0001)	(0.014)	(0.282)	(0.220)	(0.165)
7	*IncAc*	0.3516	0.2404	-0.4241	-0.7033	0.126
		(0.002)	(0.053)	(0.311)	(0.258)	(0.098)

Note: *p*-values for one-tailed test for each of the coefficients in the regression are in parentheses

The results with accounting discretion as a continuous variable are consistent with the results reported in sections 6.3.1 and 6.3.3 in Chapter 6: when accounting discretion is reduced, low foresight managers find it more difficult to achieve their reporting objective

than high foresight managers. Therefore a reduction in accounting discretion is effective in separating the earnings patterns reported by high and low foresight managers.

Table 7.5 shows that the coefficient for *Disc* is insignificant in each of the regressions 2 to 4. Accounting discretion therefore does not have an effect on the investment actions of low foresight managers. The coefficient for *ForeDisc* is not significant in regressions 2 and 4. The coefficient for *ForeDisc* in regression 3 is significant at p-value = 0.036. The test of the joint significance of *Disc* and *ForeDisc* in each of the regressions 2 to 4 reveals how accounting discretion affects the investments by high foresight managers. The test that the *Disc* and *ForeDisc* coefficients are jointly zero in each of the regressions 2 to 4 yields a p-value of 0.552, 0.056 and 0.019 for equipment, R&D and advertising respectively. The effect of accounting discretion on investments by high foresight managers is therefore significant for advertising and marginally significant for R&D. Given that the positive coefficient for *ForeDisc* more than offsets the negative coefficient in *Disc* for regression 3, an increase in accounting discretion has a positive effect on investments in R&D by high foresight managers. The negative coefficients for *ForeDisc* and *Disc* in regression 4 indicate that an increase in accounting discretion has a negative effect on investments in advertising by high foresight managers. These results with accounting discretion as a continuous variable are therefore consistent with the results reported in section 6.3.3 of Chapter 6.

Regressions 5 to 7 show the effect of accounting discretion and foresight on the use of accounting adjustments. Section 6.3.4 in Chapter 6 focuses on the manager's use of accounting adjustment in a low discretion environment. The results in regressions 5 to 7 show that, in general, foresight has an insignificant effect on the total percentage of

absolute accounting adjustments used by managers. In addition, the negative and significant coefficient for *Fore* in regression 6 indicates that low foresight managers make more income-increasing accounting adjustments than high foresight managers. The insignificance of the coefficient for *Acc* in regressions 5 to 7 indicates that an increase in the level of discretion does not change a manager's use of accounting adjustment. These results therefore are consistent with the results in section 6.3.4 of Chapter 6. In contrast to the results in section 6.3.4 of Chapter 6, the coefficient for *Fore* in regression 7 is only marginally significant (p-value =0.053).

7.3.4 Addition of covariates

Table 7.6 presents the results of the regression of *Score12* on accounting discretion, foresight and their interaction, with experience of the manager, listing status of the firm, and variability in the operating revenue as covariates. The experience of a manager may enable the manager to better report smooth increasing earnings. Similarly, managers from firms that have public listing status may be more experienced with reporting smooth increasing earnings than private firms. A recent study by Burgstahler and Dichev [1997] finds that several publicly listed firms state that their firm's objectives is to generate increasing earnings over time. The authors also find evidence of firms managing earnings in order to achieve earnings increases or positive profits during the financial year. Variability in operating revenue is included as a covariate because the presence of variability may make it more difficult for managers to consistently report smooth increasing earnings over time.

The experience of a manager is represented by the number of years a manager spent working in the financial or accounting field. The listing status is represented by a dummy variable, where '1' represents a public listed company and '0' represents a private company. The variability in operating revenue is the actual standard deviation in operating revenue over the 12 periods for each manager.

The table shows that all of the covariates except for *Listed* (p-value = 0.040) are insignificant. Managers from listed firms obtain lower scores compared to managers from private firms. Given that public listed firms are more widely held than private firms, these results are contrary to those reported by Koch [1981]. Koch finds that more smoothing occurs for widely-held firms than for closely-held firms. The addition of the covariates, however, has no effect on the significance and the direction of effect of the design variables. The coefficients for the design variables in Table 7.6 are similar to the results reported in panel A of Table 6.2 in Chapter 6.

TABLE 7.6 Results of multiple regression with experience (*Exp*), listing status (*Listed*) and variation in operating revenue (*Vn*) as covariates

Dependent variable	*Intercept*	*Fore*	*Mod*	*High*	*ForeMod*	*ForeHigh*	R^2 (Adj R^2)
Score12	-3348.88	2341.60	2404.75	2886.31	-1708.73	-2123.97	0.162
	(<0.001)	(0.001)	(0.000)	(<0.0001)	(0.025)	(0.010)	(0.117)

Exp	*Listed*	*Vn*
28.85	-613.05	10390.00
(0.106)	(0.040)	(0.216)

Note: p-values for one tailed test for each of the coefficients in the regression are in parentheses

7.3.5 Regression using effect coding of indicator variables

This section analyses the data obtained from the experiment using effect coding instead of dummy coding of the indicator variables. In psychology and behavioural studies, effect coding is commonly used as the method of analysis. Effect coding therefore represents another method of investigating the effect of discretion and foresight on scores. In effect coding, the effects of foresight and discretion are measured with respect to the average intercept instead of a base case as in dummy coding. The coefficients on *Fore*, *Mod* and *High* therefore show the deviations from the mean scores of all managers. The linear model with all the main and interaction explanatory variables is the same as that in equation 7.1, except that the indictor variables are generated from effect coding in the following manner.

Fore = 1 for high foresight
-1 for low foresight

Mod = 1 for moderate discretion
0 for high discretion
-1 for low discretion

High = 0 for moderate discretion
1 for high discretion
-1 for low discretion

The interaction variables are given by: *ForeMod* = *Fore* × *Mod* and *ForeHigh* = *Fore* × *High*. The cell parameters computed from the coefficients in equation 7.1 are presented in Table 7.7.

TABLE 7.7 Cell parameters using effect coding

Accounting Discretion	*Low foresight*	*High foresight*
Low	$\theta_1-\alpha_1-\beta_1-\beta_2+\gamma_1+\gamma_2$	$\theta_1+\alpha_1-\beta_1-\beta_2-\gamma_1-\gamma_2$
Moderate	$\theta_1-\alpha_1+\beta_1-\gamma_1$	$\theta_1+\alpha_1+\beta_1+\gamma_1$
High	$\theta_1-\alpha_1+\beta_2-\gamma_2$	$\theta_1+\alpha_1+\beta_2+\gamma_2$

With effect coding, the intercept in the regression represents the mean scores for the six foresight × discretion groups. The effect of high foresight is given by $+\alpha_1$, and for low foresight, $-\alpha_1$. The effect of foresight is given by $2\alpha_1$. The effect of low discretion is given by $-\beta_1-\beta_2$, while the effect for moderate discretion and high discretion is given by $+\beta_1$ and $+\beta_2$ respectively. The interaction terms in equation 7.1 can be expressed in terms of the average intercept for all managers (Jobson [1991]).

Coefficient for *ForeMod* (γ_1) =
(Intercept for moderate discretion – Average intercept for all discretion groups)$_{\text{High foresight}}$
–(Intercept for moderate discretion – Average intercept for all discretion groups)$_{\text{All managers}}$ (7.5)

Coefficient for *ForeHigh* (γ_2) =
(Intercept for high discretion – Average intercept for all discretion groups)$_{\text{High foresight}}$
–(Intercept for high discretion – Average intercept for all discretion groups)$_{\text{All managers}}$ (7.6)

Coefficient for interaction between foresight and low discretion ($-\gamma_1-\gamma_2$) =
(Intercept for low discretion – Average intercept for all discretion groups)$_{\text{High foresight}}$
–(Intercept for low discretion – Average intercept for all discretion groups)$_{\text{All managers}}$ (7.7)

Table 7.8 presents the regression results based on effect coding of the indicator variables. The test of significance of the interaction between foresight and low discretion is provided in Table 7.9. For the regression of *Score12* in Table 7.8, the coefficients for *Fore* and *High* are significant because their *p*-values are less than 0.01. In the case of *Mod* and *ForeHigh*, their coefficients are significant at *p*-values of 0.030 and 0.039

respectively. For *ForeMod,* its coefficient is not significant (p-value = 0.235). Thus, the foresight effect is significant while the discretion effect is stronger for low and high discretion than it is for moderate discretion. In the case of the interaction between foresight and discretion, the impact of high discretion on the effect of foresight is to cause a reduction in the foresight effect. The impact of low discretion on the effect of foresight is to cause an increase in the foresight effect (Table 7.9). For a moderate level of discretion there is no significant impact on the foresight effect.

TABLE 7.8 Regression results using effect coding for indicator variables

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
Score12	-535.273	534.088	448.714	650.529	-171.093	-437.209	0.227
	(0.002)	(0.002)	(0.030)	(0.005)	(0.235)	(0.039)	(0.186)
Equip	0.542	-0.034	0.001	0.040	0.040	-0.016	0.046
	(<0.0001)	(0.096)	(0.484)	(0.142)	(0.131)	(0.330)	(-0.005)
R&D	0.195	0.000	0.028	0.009	0.008	0.041	0.086
	(<0.0001)	(0.499)	(0.100)	(0.346)	(0.360)	(0.021)	(0.04)
Advert	0.263	0.034	-0.030	-0.049	-0.048	-0.025	0.135
	(<0.0001)	(0.067)	(0.165)	(0.065)	(0.061)	(0.218)	(0.090)
TotalAc	0.322	0.013	-0.011	-0.023	-0.027	0.005	0.080
	(<0.0001)	(0.147)	(0.262)	(0.090)	(0.052)	(0.391)	(0.031)
IncAc	0.373	-0.075	-0.039	-0.025	-0.035	-0.010	0.148
	(<0.0001)	(0.002)	(0.121)	(0.231)	(0.141)	(0.387)	(0.103)
DcrAc	0.245	-0.081	0.032	-0.020	-0.014	0.027	0.209
	(<0.0001)	(<0.0001)	(0.123)	(0.227)	(0.290)	(0.158)	(0.167)

Note: p-values for one-tailed test for each of the coefficients in the regression are in parentheses

TABLE 7.9 Results of test of hypothesis that there is no interaction between foresight and low discretion

	Coefficient for interaction between foresight and low discretion	*F-statistic*	*p-value*
Score12	644.302	5.64	0.020
Equip	-0.024	0.38	0.538
R&D	0.049	4.18	0.044
Advert	0.073	4.79	0.031
TotalAc	0.022	1.55	0.216
IncAc	0.045	0.21	0.650
DcrAc	-0.013	1.62	0.207

Table 7.8 shows that none of the coefficients for the interaction term, *ForeMod*, in Regressions 2 to 4 is significant. Only the coefficient for *ForeHigh* in regression 4 is significant. Table 7.9 shows that the coefficient for the interaction between high foresight and low discretion is significant in the *R&D* and *Advert* regressions (regressions 3 and 4). An analysis of the components of this interaction term (equation 7.7) shows that in a low discretion environment, high foresight managers make smaller investments in R&D compared to their average R&D investments under all discretion environments. This decrease is more than the decrease in R&D investments made by all managers in a low discretion environment. For advertising, the high foresight managers make more investments in a low discretion environment than their average investment under all discretion environments. This incremental investment is greater than the incremental investment made by all managers under the same circumstances.

Regressions 5 to 7 in Table 7.8 provide similar results to those in Chapter 6. There is no significant foresight effect for *TotalAc*. This implies that both foresight managers use similar amounts of accounting adjustments in achieving their reporting objective. The

significant coefficient for *Fore* in the *IncAc* regression indicates that high foresight managers use significantly more accounting adjustments to decrease earnings than the average accounting adjustments used by all managers to decrease earnings. From the *DcrAc* regression, high foresight managers are found to use significantly less accounting adjustments that increase earnings than the average accounting adjustments used by all managers to increase earnings.

7.4 ALTERNATIVE MEASURES FOR THE REPORTING OF SMOOTH INCREASING EARNINGS

7.4.1 Standard deviation, ranks and adaptation of coefficient of variation measure

The results for alternative specifications of the dependent variable, *Score12*, namely, *StdDev*, *Rank*, *Mn/StdDev* and ln(*Mn*) –ln(*StdDev*), are presented in Table 7.10. The results using *Score12*, reported in panel A of Table 6.2, are reproduced in the table to facilitate a comparison of the results.

As discussed in Chapter 4, an alternative definition of income smoothing focuses only on the variability of earnings, which is measured by the standard deviation of earnings. The first set of regression results in Table 7.10 uses standard deviation of the change in earnings as a measure of smoothing performance. The coefficients for *Mod* and *High* are all significant (p-value = 0.003 and 0.001 respectively). The coefficient for *Fore* is also significant (p-value = 0.027). The coefficient for *ForeMod* is insignificant but is marginally significant for *ForeHigh* (p-value = 0.051). In contrast to the results in Section 6.3.1, the main effects for foresight and discretion are significant but the interaction between the two effects is not as significant as that obtained using *Score12*.

TABLE 7.10 Regression results using alternative measurements for smoothing performance

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (*Adj* R^2)
Score12	–2776.91	2284.78	2327.35	2795.28	-1558.79	-2091.02	0.227
	(<0.0001)	(0.001)	(0.000)	(<0.0001)	(0.036)	(0.010)	(0.186)
StdDev	6173.08	-2286.68	-3079.62	-4305.92	1233.80	2632.78	0.162
	(<0.001)	(0.027)	(0.003)	(0.001)	(0.212)	(0.051)	(0.117)
Rank	70.364	-14.952	-14.324	-24.435	0.245	6.246	0.123
	(<0.0001)	(0.085)	(0.080)	(0.016)	(0.493)	(0.336)	(0.076)
Mn/StdDev	-0.259	0.199	0.171	0.446	0.151	-0.085	0.118
	(0.061)	(0.177)	(0.196)	(0.024)	(0.295)	(0.386)	(0.071)
ln(Mn)–	0.926	0.063	0.077	0.706	0.453	-0.022	0.098
ln(StdDev)	(0.002)	(0.436)	(0.416)	(0.041)	(0.186)	(0.484)	(0.050)

Note: *p*-values for one-tailed test for each of the coefficients in the regression are in parentheses

In the second regression, *Score12* is ranked and a regression of the ranks on the independent variables specified in equation 7.1 is performed. The regression results show that none of the coefficients is significant except for the coefficient for *High*. These results therefore contrast with those obtained when *Score12* is used (Chapter 6). Nevertheless, the rank regression results confirm that the availability of discretion enables managers to better achieve their reporting objective.

The dependent variable in the third regression in Table 7.10 is obtained by taking the quotient of the mean and standard deviation of the change in earnings. As discussed in Chapter 4, this specification is similar to the coefficient of variation used in the finance literature. Again none of the coefficients in this regression is significant except for *High*. A normality test for *Mn/StdDev* shows that the variable is not normally distributed (*Kolmogorov-Smirnov* statistic = 0.194, *p*-value = <0.01). The logarithmic transformation

of *Mn/StdDev* results in a normally distributed variable (*Kolmogorov-Smirnov* statistic = 0.081, *p*-value = 0.102). The results of the regression of this new variable on the independent variables in equation 7.1 are also provided in Table 7.10. The coefficient for *High* is significant at a *p*-value of 0.041. None of the remaining coefficients is significant.

In the experiment, the managers made decisions to maximise the scores in each period. The score used by the managers is the simple difference between the mean and the standard deviation of the earnings change (Chapter 4). Consequently, a modification to the performance measure after the experiment is completed (as in the last two regressions in Table 7.10) is unlikely to yield any significant results for the coefficients of the dependent variables. It is likely that managers did not take actions that maximised the value of these two smoothing measures.

7.4.2 Multivariate analysis of the components of the score

In the experiment, the score used to measure the reporting performance of manager *i* is a simple difference between $\overline{X}_{it}$ and σ_{it}, where $\overline{X}_{it}$ is the mean of the change in earnings from period 1 to period *t*, and σ_{it} is the standard deviation of the change in earnings from period 1 to period *t*. Details on the calculation of the score can be found in section 4.2.4 of Chapter 4. The theoretical literature on income smoothing does not provide guidance on appropriate weights for the components of the score and therefore a simple difference is used in this thesis. This score is then used in a multiple regression analysis to find the set of coefficients for the design variables that are maximally related to the score (Chapter 6, equation 6.1).

Instead of using the score as a single dependent variable, one possibility is to examine the components of the score in a multivariate framework. An examination of the correlation between the mean (*Mn*) and standard deviation (*StdDev*) of the change in earnings shows that both variables are highly correlated (Pearson correlation coefficient = 0.859, *p*-value = <0.0001). Due to this high correlation, multivariate regression is used to examine the effect of the design variables on the two dependent variables, *Mn* and *StdDev*. The multivariate regression allows one to compare the equality of coefficients across these two equations, and to test whether the coefficients in both equations are simultaneously zero. Table 7.11 presents the results. Note that since both equations in Table 7.11 contain the same independent variables, the results from the multivariate regression produces the same results as those for the individual regressions of *Mn* and *StdDev*. The results using *StdDev* as the dependent variable are reproduced from Table 7.10.

Table 7.11 shows that *Mod* and *High* have a significant effect on *StdDev*. Foresight also has a significant effect on *StdDev*. Only high discretion *(High)* has a significant effect on *Mn*. Table 7.11 also presents the results of the test that each of the coefficients in the two equations are simultaneously zero. The hypothesis is strongly rejected for *Fore*, *Mod* and *High*, and marginally rejected for *ForeMod* and *ForeHigh*. The equality of each of the coefficients in the two equations is rejected for *Fore*, *Mod*, *High* and *ForeHigh*, and marginally rejected for *ForeMod* (*p*-value= 0.071).

TABLE 7.11 Results of multivariate regression for the mean (*Mn*) and standard deviation (*StdDev*) of the change in earnings

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
Mn	3396.18	-1.90	-752.27	-1510.64	-324.99	541.75	0.074
	(<0.0001)	(0.499)	(0.136)	(0.025)	(0.367)	(0.292)	(0.024)
StdDev	6173.08	-2286.68	-3079.62	-4305.92	1233.80	2632.78	0.162
	(<0.001)	(0.027)	(0.003)	(0.001)	(0.212)	(0.051)	(0.117)
Test 1: Coefficient in both equations are zero							
Wilks' lambda		0.859	0.862	0.847	0.949	0.941	
F-statistic		7.61	7.44	8.41	2.49	2.92	
p-value		0.001	0.001	0.000	0.088	0.059	
Test 2: Coefficient in both equations are equal							
Wilks' lambda		0.884	0.866	0.847	0.966	0.944	
F-statistic		12.29	14.59	16.97	3.34	5.57	
p-value		0.001	0.000	<0.0001	0.071	0.020	

Note: *p*-values for one-tailed test for each of the coefficients in the regression are in parentheses

7.4.3 Canonical analysis

Another possibility of examining the reporting performance of managers is to use canonical correlation analysis (Jobson [1992]) to determine the relative impact of accounting discretion, foresight and their interaction on the mean and the standard deviation. In contrast to multiple regression, which determines a linear combination of a set of independent variables that is maximally related to a single dependent variable, canonical analysis determines linear combinations of a set of variables (mean and standard deviation in this thesis) that are maximally correlated with linear combinations of another set of variables (*Fore*, *Mod*, *High*, *ForeMod*, and *ForeHigh*). Consequently, the advantage of canonical correlation analysis over multivariate regression is that the former provides a linear combination of the *Mn* and *StdDev* that maximises the separation

of the six foresight × discretion groups, but multivariate regression does not yield this information. The strength of the relationship between two canonical variables (or the two sets of linear combinations) is given by the canonical correlation coefficient. The redundancy index additionally provides an indication of how much the variance in one canonical variable is shared by the variance of the other canonical variable.

Canonical coefficients are used to analyse the importance of variables in a canonical variable and the strength of the relationship between two canonical variables. Canonical coefficients, or the coefficients assigned to the original variables in each linear combination, are interpreted like those in a multiple regression equation: each weight shows the marginal contribution of the variable to the canonical variable holding all other variables constant.

Table 7.12 presents the standardised canonical coefficients for the only significant pair of canonical variables. The correlation between the two corresponding canonical variables is 0.479, which is significant (p-value = 0.001). This represents an R-square of 0.229, which is almost identical to the R-square of 0.227 obtained in the regression of *Score12* in Table 6.2. Therefore the additional variation explained by using canonical correlation appears to be very marginal. The percent of variance of the dependent variables explained by its own canonical variable is 37.7%, which is reasonably high. For the independent variables, the percent of variance explained is only 13.4%. The redundancy index, which measures the ability of the set of independent variables to explain the variation in the dependent variables, is only 3.1%.

TABLE 7.12 Canonical coefficients for the first and only pair of significant canonical variables

	First Canonical Variable	
	Standardised Canonical Coefficient	*Standardised regression coefficient from Equation 6.1*
Components of score (Z_1)		
Mean (*Mn*)	1.202	
Standard deviation (*StdDev*)	-1.822	
Percent of Variance	0.377	
Redundancy	0.087	
Predictors (W_1)		
Fore	1.353	0.615
Mod	1.298	0.614
High	1.444	0.702
ForeMod	-0.676	-0.300
ForeHigh	-0.922	-0.433
Percent of Variance	0.134	
Redundancy	0.031	
Canonical correlation	0.479	

The canonical variable for the foresight and discretion variables (W_1) shows large positive standardised coefficients for *Fore*, *Mod* and *High*, and large negative coefficients for *ForeMod* and *ForeHigh*. The canonical variable for the score variables (Z_1) describes a weighted contrast between the mean and standard deviation, where the standardised coefficient for standard deviation is approximately 50% more than that for the mean. Given the relatively higher coefficient for standard deviation, changes in W_1 have a higher impact on standard deviation than on the mean. Holding all other variables constant, when *Fore* in W_1 increases, the standard deviation decreases but the mean increases. A similar effect is found for accounting discretion (*Mod* and *High*). The

negative coefficients for the interaction terms, *ForeMod* and *ForeHigh*, suggest that the impact of accounting discretion on the two foresight groups is different.

Table 7.12 also presents the standardised coefficients from the regression in equation 6.1 in Chapter 6. A comparison of the standardised coefficients with the canonical coefficients shows that the each of the standardised coefficients is about half the value of its respective canonical coefficients. The signs of the two sets of coefficients are similar. Therefore the use of a simple difference for the mean and standard deviation for the computation of the score appears to be a reasonable measure of the reporting performance of the manager.

To further determine the reasonableness of using a simple difference for the score, a comparison of the *Score12* results with the regression results of a new score, *CanScore12*, is made. The new score is computed by using the raw canonical coefficients, instead of the standardised canonical coefficients reported in Table 7.12, as weights for *Mn* and *StdDev*. The raw canonical coefficients has not been standardised to provide the canonical variables with unit variance. As such these coefficients are appropriate when computing the new score from the unstandardised *Mn* and *StdDev*. The raw weights are 0.000633 and -0.000565 for *Mn* and *StdDev* respectively. To facilitate a comparison of the results with the *Score12* results, the regression function is multiplied by 2000. Multiplying both sides of the regression functions by a constant does not affect the significance of the results. The resultant weights for the new score are therefore 1.266 and 1.130, which are very close to the weight of unity used to compute the scores in the experiment. Table 7.13 reports the coefficients from the *CanScore12* regression after multiplying them by 2000. Table 7.13 also includes the results for *Score12* as a

comparison. The significance and sign of the coefficients in the *CanScore12* regression are similar to those in the *Score12* regression.

TABLE 7.13 Multiple regression results using canonical coefficients as weights in the computation of the score

Dependent variable & Coefficient	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2	R^2 (Adj R^2)
Score12	–2776.91	2284.78	2327.35	2795.28	-1558.79	-2091.02	0.227
	(<0.0001)	(0.001)	(0.000)	(<0.0001)	(0.036)	(0.010)	(0.186)
CanScore12	-2672.20	2580.00	2525.60	2950.40	-1804.80	-2287.40	0.230
	(<0.0001)	(0.000)	(0.000)	(<0.0001)	(0.025)	(0.009)	(0.189)

Note: *p*-values for one-tailed test for each of the coefficients in the regression are in parentheses

7.5 LOGISTIC REGRESSION

Logistic regression is used to examine whether the likelihood of a manager obtaining a particular category of score is related to the five explanatory variables, *Fore*, *Mod*, *High*, *ForeMod*, and *ForeHigh*. In Section 7.5.1, the scores are first divided into three categories (low, medium and high) and the likelihood of obtaining a particular category of scores is analysed using ordinal logistic regression. An alternative approach of examining the three categories of scores is the multinomial logit regression, which is presented in Section 7.5.3. In Section 7.5.2, the scores are divided into positive and negative scores, and binary logistic regression is used to analyse these categories.

7.5.1 Ordinal logistic regression

For the ordinal logistic regression, the scores obtained by the managers are first converted to ordinal responses by dividing the scores into three categories: high, medium and low. The categories are defined by the quartiles of *Score12* where the 25% quartile is –1112.095 and the 75% quartile is 542.845. Category Y=1 (or high scores) contains scores greater than 542.845, category Y=2 (or medium scores) contains scores between 542.845 and –1112.095, and category Y=3 (or low scores) contains scores that are less than –1112.095. The cumulative logit model used to estimate the log-likelihood has the form given in equations 7.8 and 7.9. The LOGISTIC procedure in the SAS program fits a common-slopes cumulative model, which is a parallel lines regression model based on the cumulative probabilities of the response categories rather than on their individual probabilities.

$$L_1 = \ln \frac{p(Y \le 1)}{p(Y > 1)} = \ln \left[\frac{p(High)}{p(Medium\ or\ Low)} \right] \tag{7.8}$$
$$= \theta_1 + \alpha_1 Fore_i + \beta_1 Mod_i + \beta_2 High_i + \gamma_1 ForeMod_i + \gamma_2 ForeHigh_i + \varepsilon_i$$

$$L_2 = \ln \frac{p(Y \le 2)}{p(Y > 2)} = \ln \left[\frac{p(High\ or\ Medium)}{p(Low)} \right] \tag{7.9}$$
$$= \theta_1 + \alpha_1 Fore_i + \beta_1 Mod_i + \beta_2 High_i + \gamma_1 ForeMod_i + \gamma_2 ForeHigh_i + \varepsilon_i$$

The parameter estimates from the cumulative logit model (or proportional odds model) are presented in Table 7.14. The score test for the proportional odds assumption is not rejected (χ^2 = 8.209, with a p-value of 0.145). This indicates that the slope parameters are the same across response categories. The test of the full model with all five explanatory variables against a constant only model is statistically significant (χ^2=14.752, p-value =

0.012). The estimates in the first row of Panel A represents the log-likelihood that a manager obtains a high score versus a score in the other two categories. The estimates in the second row of Panel A represents the log-likelihood that a manager obtains at least a medium score versus a low score.

TABLE 7.14 Results of logistic regression using cumulative logit with three response categories (High score, Medium score, and Low score)

Dependent variable & Coefficient	*Intercept* θ_j	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2
Panel A: Categorisation of *Score12* according to quartiles						
ln [*p*(High)/ *p*(Medium or Low)]	-2.7555 (<0.0001)	1.1578 (0.129)	1.3033 (0.069)	1.7343 (0.031)	-0.5987 (0.543)	-0.1072 (0.917)
ln [*p*(High or Medium)/ *p*(Low)]	-0.2926 (0.625)	1.1578 (0.129)	1.3033 (0.069)	1.7343 (0.031)	-0.5987 (0.543)	-0.1072 (0.917)
Panel B : Categorisation of *Score12* according to deviations from mean						
ln [*p*(High)/ *p*(Medium or Low)]	-2.8135 (<0.0001)	1.3776 (0.075)	1.3776 (0.057)	2.0369 (0.013)	-0.8119 (0.418)	-0.6184 (0.551)
ln [*p*(High or Medium)/ *p*(Low)]	0.0584 (0.921)	1.3776 (0.075)	1.3776 (0.057)	2.0369 (0.013)	-0.8119 (0.418)	-0.6184 (0.551)

Note: *p*-values for each of the coefficients in the regression are in parentheses. The *p*-values are obtained using the differences of log-likelihood ratios for regressions with and without the respective variable.

The parameter estimate for *High* in Panel A is significant and positive. The positive coefficient for *High* indicates that for the low foresight group, there is a tendency for scores to be high when accounting discretion increases. An alternative interpretation of the positive coefficient for *High* is that there is a lower likelihood that the low foresight manager obtains a low score when discretion is high. The effect of high discretion on a high foresight manager is obtained by adding the coefficient for the main effect (1.734) to

the coefficient for the interaction (-0.107), which gives a value of 1.627. An increase in discretion also increases the likelihood that a high foresight manager will get a higher score. The effect of higher accounting discretion on the two types of managers is similar because the interaction terms, *ForeMod* and *ForeHigh*, are not significant. The lack of significance in the interaction terms is in contrast to the multiple regression results presented in Chapter 6. However, the results are similar to the rank regression results presented in Table 7.10 where only the *High* coefficient is significant. In rank regression, the dependent variable is also ordinal but with many categories instead of only three categories, as analysed in this section.

Panel B of Table 7.14 provides the results of the logistic regression in which the score categories are defined by using the mean and standard deviation of *Score12*. The 'High' category comprises scores that are greater than 513.65 (or half a standard deviation above the mean). The 'Medium' category contains scores that are within half a standard deviation from the mean ($\geq$ –1352.95 to $\leq$ 513.65), and the 'Low' category contains scores that are half a standard deviation below the mean (<–1352.95). The results using both methods of categorisation are similar. The coefficient for *High* is both positive and significant, but the interaction terms are insignificant. However, the assumption of proportional odds is rejected for this set of responses (χ^2 = 11.877, with a *p*-value of 0.037). An ordinal model that does not constrain the parameters to be the same across logits for one or more of the explanatory variables, known as the partial proportional odds model, is required in this case. The separate parameters for each logit can be obtained by generating a dummy variable for each logit and multiplying each dummy variable with each of the explanatory variables. A total of 18 additional explanatory

variables would be generated from this procedure. A frequency table for each main and interaction effects against each of the response category yields sample sizes ranging from 8 to 27. Due to these small sample sizes, the partial proportional odds model could not be estimated.

The classification table in Table 7.15 shows the prediction success rates for the score categories using the two methods discussed earlier. In panel A, the logistic model correctly classifies 56% of the cases, with the highest correct classification for the medium score category (80%). The lowest correct classification is for the low score category (24%). The prediction success in panel B (60%) is higher than that of panel A. There is an improvement in prediction rate for the high score category but a slight decline in that for the low score category.

TABLE 7.15 Prediction success matrix based on fitted logistic regression model in equations 7.8 and 7.9

Observed	*No of observations*	*Predicted*			*Percent correct*
		High Score (*Y*= 1)	*Medium Score* (*Y*= 2)	*Low Score* (*Y*= 3)	
Panel A: Categorisation of scores based on quartiles					
High Score (Y= 1)	25	10	15	0	40.0%
Medium Score (Y=2)	50	5	40	5	80.0%
Low Score (Y =3)	25	3	16	6	24.0%
		18%	71%	11%	56.0%
Panel B: Categorisation of scores based on deviations from mean					
High Score (Y= 1)	18	10	16	0	38.0%
Medium Score (Y=2)	56	5	45	6	80.4%
Low Score (Y =3)	26	3	10	5	27.8%
		18%	71%	11%	60.0%

7.5.2 Binary logistic regression

An alternative method for categorising the scores is to divide them into positive and non-positive scores. Logistic regression is performed to determine whether the five explanatory variables can explain membership in the two categories. The binary logit model is given in equation 7.10.

$$L_1 = \ln \frac{p(\text{Positive})}{p(\text{Negative})} = \theta_1 + \alpha_1 Fore_i + \beta_1 Mod_i + \beta_2 High_i + \gamma_1 ForeMod_i + \gamma_2 ForeHigh_i + \varepsilon_i \quad (7.10)$$

The results are presented in Table 7.16. In contrast to the ordinal response model in equations 7.8 and 7.9, none of the parameter estimates in this binary response model is significant. Stepwise regression using forward selection of the variables is further performed to identify the effects that differentiate the two types of scores. Results of the

forward selection process are summarised in Table 7.16. The final regression model from the stepwise procedure includes only the main effects. In this final model, the coefficient for *High* is significant while that for *Fore* is marginally significant.

TABLE 7.16 Results of logistic regression for the likelihood that a manager obtains a positive score(*prob*)

Dependent variable & *Coefficient*	*Intercept* θ_1	*Fore* α_1	*Mod* β_1	*High* β_2	*ForeMod* γ_1	*ForeHigh* γ_2
ln[*prob*/(1 - *prob*)]	-0.9808	0.6242	0.5754	0.9808	0.1868	0.3314
	(0.147)	(0.456)	(0.256)	(0.256)	(0.862)	(0.768)
ln[*prob*/(1 - *prob*)]	-1.104	0.8104	0.6987	1.1783		
	(0.025)	(0.059)	(0.187)	(0.033)		

Note: *p*-values for each of the coefficients in the regression are in parentheses. The *p*-values are obtained using the differences of log-likelihood ratios for regressions with and without the respective variable.

7.5.3 Multinomial logit analysis

In Section 7.5.1, when the tails of the *Score12* distribution are compared to the rest of the distribution, the coefficients for *Mod* and *High* are significant and the coefficient for *Fore* is marginally significant. However, none of the coefficients is significant when the positive and negative halves of the distribution are compared (Section 7.5.2). One can therefore surmise that foresight and discretion may be important in distinguishing the tails of the distribution. This section provides a test of this hypothesis.

Table 7.17 presents the results for the simultaneous equation estimation of the multinomial logit model, using main effects as the only explanatory variables. The categories are given by *LowScore*, *MedScore* and *HighScore* to represent low scores, medium scores and high scores respectively. The simultaneous equation method is used to ensure that the total probability of the response categories sum to one (Jobson [1991]).

The interaction terms are omitted in Table 7.17 because of their lack of significance in the full model. The table shows that high accounting discretion has a significant effect on the probability that a manager obtains a high score versus a moderate score. The coefficients for *Fore* and *Mod*, however, are insignificant. The table also shows that having a moderate level of discretion lowers the probability that a low score versus a moderate score will be obtained. One would expect that the coefficient for *High* to be significant as well. However, the table shows that this coefficient is insignificant.

The table also provides the effect of foresight and discretion on the probability of obtaining a high score versus a low score. The coefficients for *Fore* and *High* are both significant. These results therefore show that high foresight and high discretion are useful in distinguishing between high and low scores.

TABLE 7.17 Results of simultaneous multinomial logit equation estimation

	Intercept	*Fore*	*Mod*	*High*
ln(*HighScore/MedScore*)	-0.835	0.425	-0.444	0.902
	(0.004)	(0.117)	(0.239)	(0.012)
ln(*LowScore/MedScore*)	-0.704	-0.273	-0.718	-0.027
	(0.008)	(0.307)	(0.050)	(0.946)
ln(*HighScore/LowScore*)	-0.132	0.699	0.274	0.928
	(0.685)	(0.029)	(0.547)	(0.031)

Note: *p*-values for each of the coefficients in the regression are in parentheses.

7.6 DISCUSSION

7.6.1 Separation in earnings reported by managers

In Chapter 6, the regression analysis show that a reduction in discretion creates a significant separation in earnings reported by managers. The sensitivity analysis in Section 7.3 shows that this result is robust to modifications to the estimating equation 7.1. Similar to the results on *Score12*, the results for *Score4* and *Score8* show that a reduction from high to low discretion has a larger negative effect on low foresight managers than on high foresight managers.

The use of different partitions for the accounting discretion categories provides results similar to those in Section 6.3.1. The use of accounting discretion as a continuous variable instead of a discrete variable shows that when accounting discretion is reduced, low foresight managers experience greater difficulty in smoothing earnings than high foresight managers. The addition of three covariates (experience, listing status and variability of operating revenue) does not affect the significance of the design variables. Except for listing status, none of the covariates is significant.

The canonical correlation analysis provides additional information on how the set of design variables affects the components of the score. Section 7.4.3 shows that the two sets of variables are significantly and positively correlated. Given the positive canonical correlation, managers with foresight or discretion are able to increase the mean of earnings change relative to its standard deviation. Changes in foresight or discretion have a greater impact on the standard deviation than on the mean of the change in earnings. The negative sign for coefficients in the interaction terms (*ForeHigh* and *ForeMod*)

moderates the increase in mean earnings change relative to its standard deviation for managers who have both discretion and foresight.

Two sets of results which appear to be less supportive of the use of a reduction of accounting discretion as a separating mechanism are: (1) the use of standard deviation, and the quotient of mean and standard deviation as measures of smoothing performance, and (2) logistic regression, which examines the probability that a manager obtains a high score.

One reason for the weaker results is that the standard deviation analysis focuses on only one aspect of smoothing performance instead of the manager's total smoothing performance. In the experiment, the managers are required to maximise the mean of earnings change while minimising its standard deviation when making operating and accounting decisions. Consequently, by examining only the standard deviation of earnings, information on a managers' ability to maximise the mean is disregarded.

The multinomial logit results show that both high discretion and high foresight are important in distinguishing managers with high scores from those with low scores. In contrast, the ordinal logistic analysis shows that only high discretion increases the likelihood that a manager achieves a high score. When a two-category classification based on the signs of the score is used, none of the factors is significant. None of the interaction terms in all three types of logistic regression is significant, unlike the results from the main analysis of Chapter 6. Given that there is no theoretical prediction on which level of score constitutes a superior ability to smooth earnings, the logistic analysis relies on the characteristics of the distribution of scores such as quartiles, mean and standard deviation to classify the responses. The lack of significance in the foresight ×

discretion interaction may be due to the fact that this classification system does not accurately delineate managers who are able to smooth from those who are unable to smooth. Nevertheless, even with the coarseness of the classification, the multinomial logistic regression shows that high levels of discretion and foresight contribute positively to the likelihood that managers can achieve a high score. A concern of regulators is that a high level of accounting discretion will lead to a deterioration of financial reporting because opportunistic managers can report smooth earnings similar to those of value-maximising managers. The logistic results provide evidence that this concern of regulators may be warranted. This result also corroborates the result in Section 6.3.1, which demonstrates that at high levels of discretion, the scores of the high and low foresight managers are indistinguishable.

7.6.2 Interaction between operating and accounting choices

The analysis using different partitions for accounting discretion (Section 7.3.2) provides additional support for the finding that there is an interaction between accounting discretion and a manager's operating choices. The results using accounting discretion as a continuous variable (Section 7.3.3) are generally similar to the results reported in Section 6.3.2.

7.6.3 Percentage of accounting adjustments

The use of different partitions for the accounting discretion categories does not alter the conclusions presented in Section 6.4.3. The regression results using accounting discretion as a continuous variable show that both types of managers use similar amounts

of total accounting adjustments. Low foresight managers also make significantly more income-increasing adjustments than high foresight managers. The level of discretion does not affect the type of accounting adjustment used by managers. However, unlike the results in Section 6.3.4, this regression shows that the income-decreasing adjustments by high foresight managers are only marginally greater than that of low foresight managers.

8 PROFILE ANALYSIS: RESULTS AND DISCUSSION

8.1 INTRODUCTION

In the experiment, the smoothing performance of a manager at a particular smoothing duration is represented by a score. Smoothing duration refers to the number of periods over which managers are required to smooth earnings. Since a minimum of two periods is required for smoothing to take place, there are only 11 durations (duration 2 to duration 12) for the 12 periods of reported earnings. A detailed explanation of the score is given in section 4.2.4 of Chapter 4. In essence, the score of manager i in period t, is given by $Score_{it} = \overline{X}_{it} - \sigma_{it}$ where $\overline{X}_{it}$ is the mean of the change in earnings from period 1 to period t, and σ_{it} is the standard deviation of the change in earnings from period 1 to period t. If $t = 5$ (alternatively, smoothing duration = 5), the score reflects how well the manager smoothes over the current period and the previous four periods, and if $t = 10$ (or smoothing duration = 10), the score reflects the manager's smoothing performance over the current period and the previous nine periods. The more positive the score, the greater the ability of managers to report smooth increasing earnings over the given duration. A negative score indicates that the reported earnings series is volatile.

The tests of hypotheses H1 to H4 in Chapter 6 utilise data on the smoothing performance of managers at smoothing duration 12 to examine the effect of two between-subject factors (foresight and discretion) on the smoothing performance of managers. In the experiment, however, the smoothing performance of a manager is measured at every

smoothing duration up to duration 12. The experiment can therefore be viewed as a 2 × 3 × 11 (foresight × discretion × duration) design, with smoothing duration as a within-subject variable. The set of scores for each manager obtained in the experiment represents the repeated observations on that manager over time. This sequence of repeated observations is referred to as the profile of the manager. A profile can also be obtained for a group of managers. In this case, the profile is the set of mean values of scores at each duration for all managers in that group.

Hypothesis H5 in Chapter 3 predicts that there is a significant three-way interaction for duration, foresight and discretion, and that there are significant differences in the profiles of the foresight × discretion groups. This chapter uses profile analysis (Jobson [1992]) to test hypothesis H5. Table 8.1 presents the notation (*P1* to *P6*) used in this chapter to denote the profiles of the foresight × discretion groups. It also shows the cell sample sizes for the six foresight × discretion groups.

TABLE 8.1 Number of observations and notation for discretion × foresight groups

Discretion	*Notation*		*No of observations*	
	Low foresight	*High foresight*	*Low foresight*	*High foresight*
Low	*P1*	*P2*	11	17
Moderate	*P3*	*P4*	25	15
High	*P5*	*P6*	14	18

8.2 PROFILE ANALYSIS

Profile analysis (or repeated measures analysis) may be regarded as a special case of MANOVA technique used in Section 6.3.4 of Chapter 6. MANOVA is concerned with comparing a mean vector (or profile) across several groups of subjects. If the vector of measurements (profiles) represents repeated observations on the same individual under different conditions then the variation (shape) of these observations over the different conditions is of interest. Profile analysis is concerned with the shapes of these profiles, and a comparison of these shapes across different groups of subjects. The technique focuses on relationships among the elements of the mean vector and how these relationships vary across the groups. Profile analysis is therefore appropriate for the testing of hypotheses about within-subject (smoothing duration) effects, and the testing of hypotheses about within-subject-by-between-subject (smoothing duration-by-group) interactions.

Profile analysis usually involves a sequence of three comparisons. The first tests for parallel profiles, the second for equal profiles, and the last for horizontal profiles. If the parallelism hypothesis is rejected, the remaining two tests are not meaningful (Jobson [1992]). When profiles are not parallel, contrasts among profiles are usually performed to determine the causes of non-parallelism (Tabachnick and Fidell [2001]).

Profile analysis has been used by Beaver [1966] to compare the financial ratios of bankrupt and non-bankrupt firms. It has also been used by DeAngelo et al. [1992] to compare non-profitable and profitable firms, and by Larcker [1987] to measure the differences between experimental and control banks along several financial dimensions.

Finally, Shevlin [1987] employs this technique to compare firms that conduct R&D in-house with firms that conduct R&D through limited partnerships.

8.3 GENERAL LINEAR MODEL FOR PROFILE ANALYSIS

A requirement of profile analysis is that in every experimental cell, the number of experimental units (participants) should be larger than the number of repeated measurements (Tabachnick and Fidell [2001]). Tabachnick and Fidell [2001] argue that a small sample size to repeated measurements ratio may cause a rejection of the assumption of homogeneity of variance-covariance matrices, which makes profile analysis an inappropriate analytic tool. In addition when the ratio requirement is not satisfied, the power of the profile analysis may be compromised as a result of reduced degrees of freedom. When such a situation arises, Krzanowski [1988] recommends analysing a sub-set of the repeated measurements data in the profile analysis.

Due to the random assignment of participants to treatments, Table 8.1 shows that the group with the smallest number of participants is the low-foresight-low-discretion group. Its sample size of 11 is equal to the number of repeated measurements. Recall that there are only 11 repeated measurements of the score (*Score2* to *Score12*) for the participants in each group because the scores are calculated from a change in earnings over 12 periods of usable earnings data. The first score is computed in period two (*Score2*) and the last score is computed in period 12 (*Score12*). The ratio requirement in (Tabachnick and Fidell [2001]) is therefore not satisfied for the low-foresight-low-discretion group. Following Krzanowski [1988], the score at duration 12 (*Score12*) is omitted from the list of dependent variables, which leaves a total of ten dependent variables (*Score2* to

Score11) for the profile analysis. With this omission, the number of dependent variables (ten) is less than any of the cell sample sizes (11 to 25) shown in Table 8.1. Since the choice of the number of smoothing periods in the experiment is arbitrary, the omission of *Score12* is not expected to affect the analysis significantly. To ensure that the results are not driven by this omission, sensitivity analysis is provided in Section 8.5. In that section, the effect of omitting the first score (*Score2*) instead of the last score (*Score12*) is examined.

Given these considerations, the general linear model used to test whether duration has an effect on the between-subject factors and their interaction is presented in equation 8.1. This model has foresight and discretion as the between-subject factors and the smoothing duration as a within-subject factor. The matrix ***G*** is the design matrix used to model the differences among the six foresight × discretion groups, and is characterised by the main effects (foresight and discretion) and interaction effects (foresight × discretion). The ***B*** matrix contains 10 columns, one for each duration. The six elements in each column of ***B*** are the parameters estimates for the main and interaction effects.

$$\boldsymbol{Score} = \boldsymbol{GB} + \boldsymbol{U} \tag{8.1}$$

where each matrix in the equation is made up of vectors. The matrices are given by:

$$\boldsymbol{Score}_{(100\times10)} = [\boldsymbol{Score}2 \quad \ldots \quad \boldsymbol{Score}11], \; \boldsymbol{G}_{(100\times6)} = [1 \; \boldsymbol{G}2 \; \boldsymbol{G}3 \ldots \boldsymbol{G}6], \; \boldsymbol{B}_{(6\times10)} = \begin{bmatrix} \beta_1 \\ \vdots \\ \beta_6 \end{bmatrix},$$

and $\boldsymbol{U}_{(100\times10)} = [\boldsymbol{u}_1 \quad \ldots \quad \boldsymbol{u}_{10}]$. ***Score2*** is the vector of scores for duration 2, ***Score3*** is the vector of scores for duration 3, and so forth. ***G2*** to ***G4*** are the vectors of dummy variables for the between-subject factors, foresight and discretion. ***G2*** is the vector of dummy variables for high foresight, ***G3*** to ***G4*** are vectors of dummy variables for moderate and

high discretion factor respectively, and ***G5*** to ***G6*** are vectors of dummy variables for the two-way interaction between foresight and discretion. β_1 is the vector of intercepts or the mean for the low foresight-low discretion group. β_2 to β_4 are the vectors of regression coefficients for high foresight, moderate discretion and high discretion respectively, and β_5 to β_6 are the vectors of coefficients for the interaction factors. ***U*** is the error matrix.

This MANOVA model may be viewed as 10 distinct ANOVA models, one for each duration level. Each column of scores represents the scores at one of the 10 duration levels. In Chapter 6, the analysis focuses on scores at a particular duration (duration 12). In this chapter, MANOVA is used to compare the scores across all durations. As such, this MANOVA analysis can be viewed as an extension of the analysis performed in Chapter 6.

In the MANOVA model, tests of hypotheses regarding in elements of the parameter matrix ***B*** take the general form of tests for $\boldsymbol{ABM} = \mathbf{0}$. In the absence of an ***M*** matrix, the ***A*** matrix is used to generate contrasts among the regression coefficients within each of the 10 duration equations. In this way, 10 distinct ANOVA comparisons can be carried out simultaneously. For instance, one may be interested in the equality of the means for the high foresight and low foresight groups at each duration. This can be tested by determining whether β_2 is significantly different from zero in each of the 10 duration equations. In other words, each element in the vector β_2 is tested for significance from zero.

The ***M*** matrix is used to generate contrasts in the regression coefficients across the 10 duration equations. The ***M*** matrix permits the 10 ANOVA models to be compared. In the formulation given in equation 8.1, the profiles represent foresight effect, discretion effect

and the foresight × discretion interaction effect. Each profile contains 10 points representing the components of the duration mean vector for a particular effect. Profile analysis allows one to determine whether these effects are dependent on duration, that is, whether there is a change in patterns for these effects over the 10 durations. For instance, one may be interested in whether the pattern of difference between the mean scores for the foresight groups change over the 10 durations. The analysis involves a comparison of the 10 components of the mean vector for the effect of interest by the construction of suitable $\boldsymbol{A}$ and $\boldsymbol{M}$ matrices in the relation $\boldsymbol{ABM} = \boldsymbol{0}$ in order to analyse whether the profiles are parallel, horizontal and equal.

In addition to the prediction that the three-way interaction (duration × foresight × discretion) is significant, hypothesis H5 also makes specific predictions about relationships among the profiles of the six foresight × discretion groups. In order to test these specific predictions, the general linear model given in equation 8.1 is modified such that $\boldsymbol{G}$ now represents the matrix of vectors of dummy variables for the six foresight × discretion groups. Again by specifying appropriate $\boldsymbol{M}$ and $\boldsymbol{A}$ matrices in the relation, $\boldsymbol{ABM} = \boldsymbol{0}$, tests of parallel, equal and horizontal profiles among subsets of the six groups can be conducted.

If any of the profiles are found not to be parallel, an ANOVA of Helmert contrasts is used to determine how the profiles change over the length of the smoothing duration (Khattree and Naik [1995]). In a Helmert contrast, the mean of one dependent variable (scores) is compared with the mean of the subsequent dependent variables. This method of contrast therefore allows one to identify the point at which the score ceases to change. To obtain the Helmert contrast, the $\boldsymbol{M}$ matrix is defined as follows:

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -0.111 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -0.111 & -0.125 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ -0.111 & -0.125 & -0.142 & 1 & 0 & 0 & 0 & 0 & 0 \\ -0.111 & -0.125 & -0.142 & -0.167 & 1 & 0 & 0 & 0 & 0 \\ -0.111 & -0.125 & -0.142 & -0.167 & -0.20 & 1 & 0 & 0 & 0 \\ -0.111 & -0.125 & -0.142 & -0.167 & -0.20 & -0.25 & 1 & 0 & 0 \\ -0.111 & -0.125 & -0.142 & -0.167 & -0.20 & -0.25 & -0.33 & 1 & 0 \\ -0.111 & -0.125 & -0.142 & -0.167 & -0.20 & -0.25 & -0.33 & -0.50 & 1 \\ -0.111 & -0.125 & -0.142 & -0.167 & -0.20 & -0.25 & -0.33 & -0.50 & -1 \end{bmatrix}$$

A Helmert contrast for duration 4, for instance, measures the difference in the mean score for duration 4 with the mean score for all subsequent durations. The final Helmert contrast therefore measures the difference in mean scores for the last two durations. All tests in this chapter are performed using the PROC GLM procedure in SAS.

8.4 RESULTS ON SMOOTHING DURATION

8.4.1 ANOVA results for scores at each duration

Given that the MANOVA model discussed in Section 8.3 may be viewed as 10 distinct ANOVA models (one for each duration level), as a preamble to the MANOVA analysis, this section presents the results for these ANOVA models. In Table 8.2, the first row for each duration shows the F-statistics while the values in parentheses are their associated p-values. The main and interaction effects are significant at all durations except for duration 4, 5 and 6 where the foresight effect is insignificant, and duration 3 where the interaction is significant.

TABLE 8.2 ANOVA results for scores at durations 2 to 11

Duration n	Foresight	Discretion	Foresight × Discretion
$n = 2$	10.78	5.12	4.04
	(0.001)	(0.008)	(0.021)
$n = 3$	5.63	3.86	0.79
	(0.020)	(0.025)	(0.459)
$n = 4$	0.34	3.81	8.28
	(0.560)	(0.026)	(0.001)
$n = 5$	0.16	1.53	5.61
	(0.694)	(0.221)	(0.001)
$n = 6$	0.30	3.81	4.11
	(0.585)	(0.026)	(0.019)
$n = 7$	13.74	5.39	5.04
	(0.000)	(0.006)	(0.008)
$n = 8$	15.59	6.21	4.41
	(0.000)	(0.003)	(0.015)
$n = 9$	14.73	6.26	3.74
	(0.000)	(0.003)	(0.027)
$n = 10$	16.54	7.66	5.94
	(<0.0001)	(0.001)	(0.004)
$n = 11$	13.84	6.66	5.36
	(0.000)	(0.002)	(0.006)

8.4.2 Effect of duration on between-subject factors

Figures 8.1a, 8.1b and 8.1c respectively show the profiles of the two foresight groups, the profiles for the three discretion groups, and profiles for the six foresight × discretion profiles over durations 2 to 11. An examination of the plots in Figures 8.1a to 8.1c shows that the effects of foresight, discretion and their interaction are not constant across durations. Due to the use of similar axes in Figures 8.1a to 8.1c, a few of the profiles in Figure 8.1c appear clustered together. A more detailed presentation of these six foresight × discretion profiles is available in Figures 8.2a to 8.2c.

Hypothesis H5 states that compared to high foresight managers, low foresight managers find it more difficult to smooth earnings over a longer duration in a low accounting discretion environment than in a high or moderate discretion environment. The hypothesis therefore predicts that there is a significant three-way interaction between duration, foresight and discretion. Table 8.3 presents the profile analysis results for profiles. The profile analysis examines whether the foresight profiles (Figure 8.1a), discretion profiles (Figure 8.1b) and foresight × discretion profiles (Figure 8.1c) are affected by duration. The table shows that smoothing duration has a significant effect on the smoothing performance of managers (p-value =<0.0001). Duration has a significant effect on the foresight × discretion interaction (p-value = 0.001), which provides support for hypothesis H5. The table also shows that the profiles for the two foresight groups are not parallel (p-value = 0.013). Smoothing duration has only a marginal effect on discretion (p-value = 0.081).

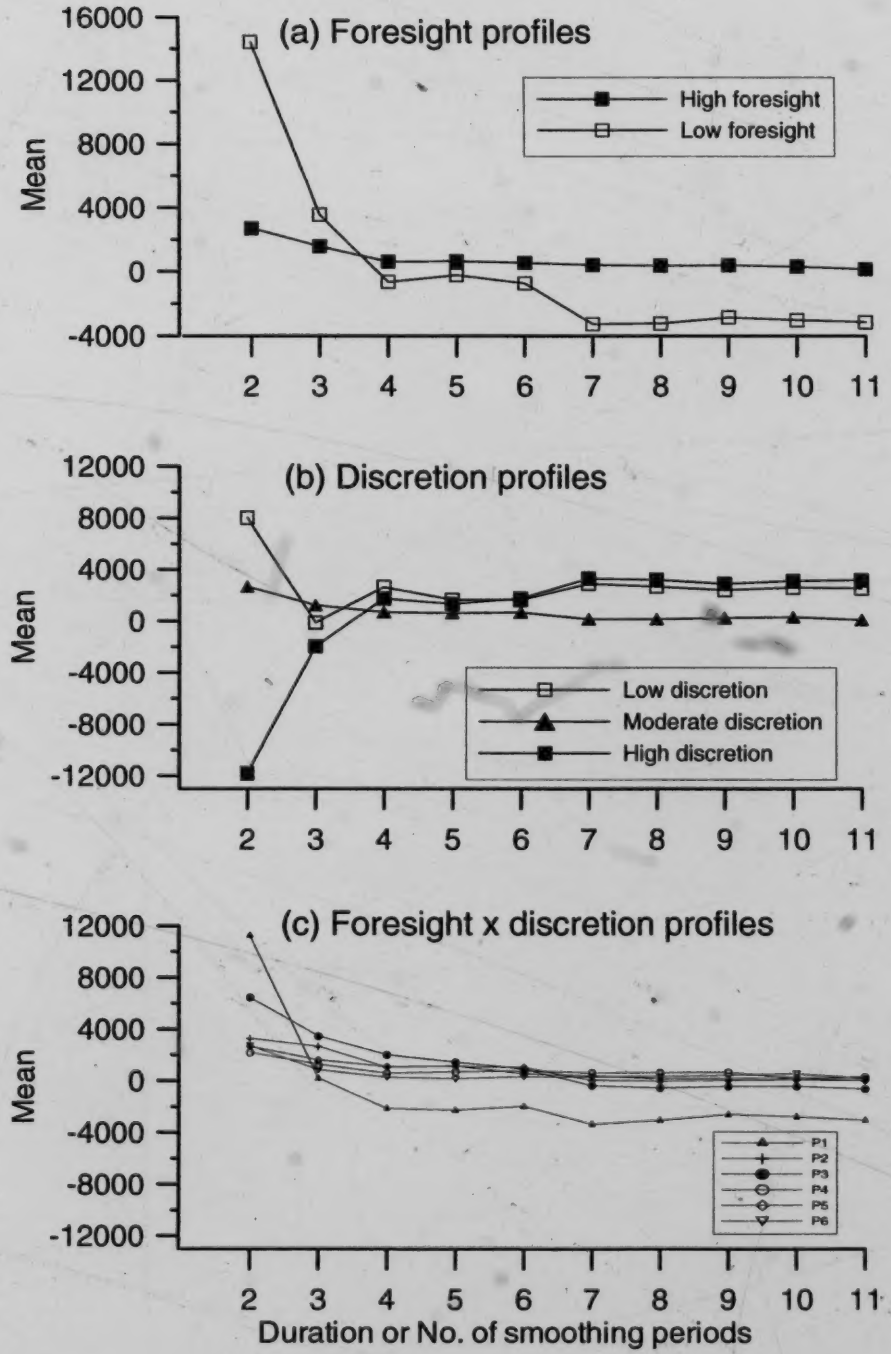


FIGURE 8.1 Profiles of foresight, discretion and interaction between foresight and discretion

TABLE 8.3 Results of profile analysis for scores from duration 2 (*Score2*) to duration 11(*Score11*)

	Wilks' Lambda	*F*-value	Degrees of freedom	*p*-value
Duration	0.635	5.50	9, 86	<0.0001
Duration × Foresight	0.791	2.53	9, 86	0.013
Duration × Discretion	0.741	1.54	18, 172	0.081
Duration × Fore × Discretion	0.630	2.48	18, 172	0.001

A significant interaction between duration and foresight indicates that the profiles of the two foresight groups are not parallel. In contrast, the lack of a significant interaction between duration and discretion suggests that the discretion profiles are parallel. The significant three-way interaction between duration and the between-subject factors implies that duration has a different effect on the six foresight × discretion profiles. Hypothesis H5 provides specific predictions about how the six profiles interact with duration. Tests of these specific predictions are discussed in section 8.4.3.

Having identified the non-parallel profiles, Helmert contrasts are used to determine how these profiles change over the smoothing durations. In Table 8.4, for each duration, the first row reports the *F*-statistics for the Helmert contrast, and the values in parentheses in the second row are the *p*-values for these *F*-statistics. The Helmert contrasts in Table 8.4 show that the scores decline significantly for smoothing durations of up to six periods. The scores of both foresight groups show significantly different rates of decline over the first six durations. Beyond that, effect of smoothing duration on the scores of the two foresight groups are not significant. The table also shows that the effect of duration on foresight × discretion at duration 2 is significantly different from the rest of the durations.

TABLE 8.4 ANOVA results of Helmert contrast of the dependent variables from duration 2 (*Score2*) to duration 11 (*Score11*)

Contrast of duration n with durations greater than n	Mean	Foresight	Discretion	Foresight × Discretion
$n = 2$	35.84	11.83	5.87	5.15
	(<.0001)	(0.001)	(0.004)	(0.008)
$n = 3$	44.77	10.82	6.59	1.51
	(<.0001)	(0.001)	(0.002)	(0.227)
$n = 4$	24.52	13.74	2.09	1.20
	(<.0001)	(0.000)	(0.130)	(0.306)
$n = 5$	36.85	18.87	5.10	0.24
	(<.0001)	(<.0001)	(0.008)	(0.790)
$n = 6$	28.94	16.96	2.28	0.84
	(<.0001)	(<.0001)	(0.108)	(0.436)
$n = 7$	0.37	0.77	0.66	1.02
	(0.542)	(0.383)	(0.520)	(0.365)
$n = 8$	0.13	2.45	0.95	0.52
	(0.715)	(0.121)	(0.389)	(0.595)
$n = 9$	3.40	0.16	0.72	1.01
	(0.068)	(0.688)	(0.491)	(0.366)
$n = 10$	5.23	0.08	0.63	2.00
	(0.024)	(0.776)	(0.536)	(0.142)

Note: p-values for each of the coefficients in the regression are in parentheses.

8.4.3 Effect of duration on foresight × discretion profiles

Section 8.4.2 shows that the three-way interaction (foresight × discretion × duration) is significant (p-value = 0.001). This indicates that the six foresight × discretion profiles have different interactions with duration. Hypothesis H5 provides specific predictions about their interactions with duration: it predicts that the profiles of the high and low foresight groups are not parallel at low levels of discretion, but are parallel at high levels of discretion.

The six foresight × discretion profiles are plotted in Figure 8.2a to Figure 8.2c. The figure shows that the initial scores of the low foresight group are mostly higher than those of the high foresight group in all three figures. The scores for both foresight groups also show a decline over the smoothing duration. However, relative to the high foresight group, the low foresight group shows a steeper decline in scores in the moderate and low discretion panels as duration increases (Figure 8.2a and Figure 8.2b). In the low discretion environment, by duration 4, the scores of the low foresight group decline below those of the high foresight group. In the moderate discretion panel, the scores of the low foresight group decline below those of the high foresight group when duration is greater than 7.

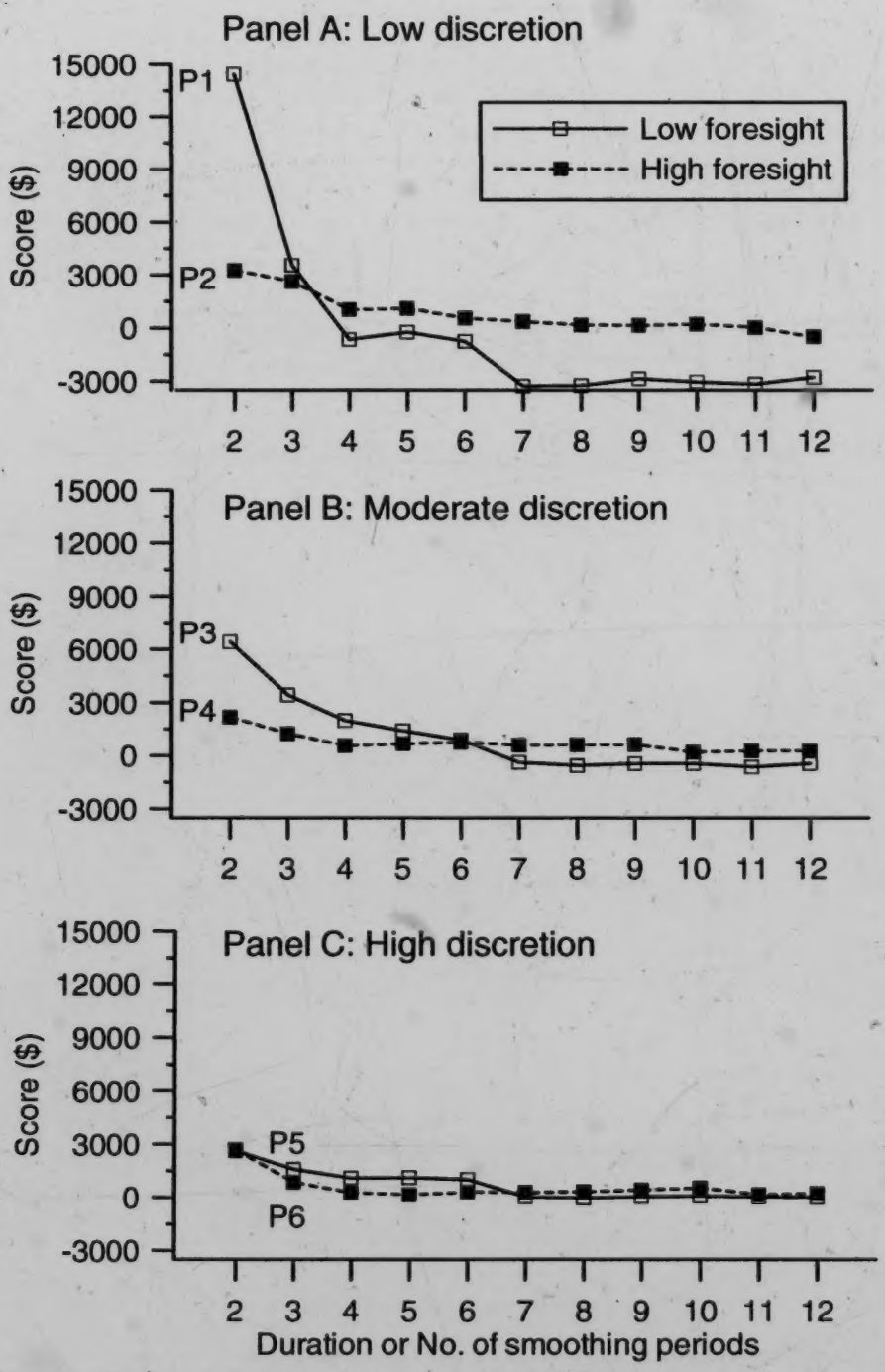


FIGURE 8.2 Profiles of foresight groups within discretion partition

Profile analysis is used to examine whether the profiles in each of the three figures are parallel. The results are presented in Table 8.5. The table shows that only the two foresight profiles in the high discretion panel (*P5* and *P6*) are parallel. The remaining two sets of profiles (*P1* and *P2*, and *P3* and *P4*) are not parallel. For the parallel foresight profiles (*P5* and *P6*), further tests are carried out to determine whether they are equal and horizontal. The test of equal profiles and the test of horizontal profiles provide *p*-values of 0.670 and 0.384 respectively, which suggest that *P5* and *P6* profiles are equal and horizontal. These results demonstrate that when low foresight managers are given high discretion, their smoothing performance across all durations is similar to that of the high foresight managers. In contrast, at moderate and low discretion, the smoothing performance of low foresight manager differs from that of high foresight managers.

TABLE 8.5 Results of the test for parallel, equal and horizontal profiles within discretion category

	Main Analysis			Sensitivity Analysis	
	Score2 to *Score11*			*Score3* to *Score12*	
	Wilks' Lambda	*F*-value	*p*-values	*p*-values	Consistent with main analysis?
Panel A: Comparison of profiles within discretion groups					
Parallel profiles					
P1 and *P2*	0.741	3.34	0.002	<0.0001	Yes
P3 and *P4*	0.773	2.80	0.006	0.005	Yes
P5 and *P6*	0.872	1.40	0.200	0.209	Yes
Equal profiles					
P5 and *P6*	0.998	0.18	0.670	0.744	Yes
Horizontal profiles					
P5 and *P6*	0.808	1.07	0.384	0.385	Yes
Panel B: Comparison of profiles at durations greater than 7.					
	Score7 to *Score11*			*Score7* to *Score12*	
Parallel profiles					
P1 and *P2*	0.915	2.11	0.086	<0.0001	No
P3 and *P4*	0.926	1.82	0.133	0.164	Yes
Equal profiles					
P1 and *P2*	0.817	21.08	<0.0001	n/a	n/a
P3 and *P4*	0.974	2.48	0.119	0.124	Yes
Horizontal profiles					
P1 and *P2*	0.957	1.03	0.395	n/a	n/a
P3 and *P4*	0.857	1.83	0.075	0.083	Yes

Given the non-parallelism of *P1* and *P2* profiles, and *P3* and *P4* profiles, Helmert contrasts are used to determine the point at which the scores cease to change between the two profiles. The results are presented in Table 8.6, with the *F*-statistics reported in the first row of each duration and their associated *p*-values in the second row of each duration. The difference in scores between *P1* and *P2* reaches a constant (with *P1* below *P2*) when the smoothing duration is seven durations or longer. A similar result is obtained for the two profiles in the moderate discretion panel, *P3* and *P4*.

TABLE 8.6 Results of Helmert contrast for the difference between pairs of foresight × discretion profiles

Contrast of duration n with durations greater than n	Profiles		
	P1-P2	*P3-P4*	*P5-P6*
$n = 2$	17.88	2.57	0.01
	(<0.0001)	(0.112)	(0.932)
$n = 3$	7.78	5.50	0.29
	(0.006)	(0.021)	(0.593)
$n = 4$	2.60	13.21	1.84
	(0.110)	(0.001)	(0.178)
$n = 5$	7.16	8.57	3.83
	(0.009)	(0.004)	(0.053)
$n = 6$	10.32	4.28	3.13
	(0.002)	(0.041)	(0.080)
$n = 7$	2.49	0.01	0.08
	(0.118)	(0.912)	(0.772)
$n = 8$	1.22	2.41	0.01
	(0.272)	(0.124)	(0.923)
$n = 9$	0.59	1.69	0.12
	(0.446)	(0.196)	(0.735)
$n = 10$	0.06	1.81	2.14
	(0.807)	(0.182)	(0.147)

Note: p-values for each of the coefficients in the regression are in parentheses

Figure 8.2a additionally shows that from duration 7 to 11, *P1* appears to be parallel to *P2;* a similar pattern is observed for *P3* and *P4* (Figure 8.2b). A parallelism test of the profiles *P1* and *P2*, and *P3* and *P4* from duration 7 to duration 11 is carried out. The tests confirm that both sets of profiles are parallel from duration 7 onwards. Panel B of Table 8.5 shows that profiles *P3* and *P4* are horizontal between durations 7 to 11. These two profiles are also equal at these durations. The equality of profiles *P1* and *P2* is rejected. The profiles are, however, horizontal.

The parallelism tests for duration 7 to 11 show that in a moderate discretion environment, although the score of the low foresight group declines over time, the increase in smoothing periods from duration 7 to 11 does not significantly affect the ability of low foresight group to report the same level of scores as the high foresight group. In contrast, in the low discretion environment, the low foresight group is unable to achieve the same level of smoothing performance as the high foresight group when duration increases. The scores of the low foresight group for durations 7 to 11 for this level of discretion are distinctly lower than those of the high foresight group.

8.5 SENSITIVITY ANALYSIS

Section 8.4 examines hypothesis H5 using the profiles of scores from duration 2 to 11. In this section, hypothesis H5 is re-examined using profiles of scores from duration 3 to 12. The results are presented in Tables 8.7 and 8.8.

8.5.1 Effect of duration on between–subject factors

The results in Table 8.7 are similar to those from the main analysis presented in Table 8.3. Table 8.7 shows that smoothing duration has a significant effect on foresight and on the foresight × discretion interaction. However, unlike the results in Table 8.3, duration shows a significant interaction with discretion.

Table 8.8 presents the results for the Helmert contrasts. Again the first row at each duration contains the *F*-statistics and the second row contains the *p*-value relating to these *F*-statistics. The Helmert contrasts for foresight, discretion and foresight × discretion from duration 3 to duration 11 are largely similar to those in Table 8.4. However, Table 8.8 shows that the additional comparison between duration 11 and duration 12 is significant for foresight and foresight × discretion.

TABLE 8.7 Sensitivity analysis – Results of profile analysis of scores for duration 3 (*Score3*) to duration 12(*Score12*)

	Wilks' Lambda	*F-value*	*Degrees of freedom*	*p-value*
Duration	0.612	6.07	9, 86	<0.0001
Duration × Foresight	0.738	3.40	9, 86	0.001
Duration × Discretion	0.691	1.94	18, 172	0.016
Duration × Fore × Discretion	0.605	2.73	18, 172	0.000

TABLE 8.8 Sensitivity analysis - ANOVA results of Helmert contrast of scores for durations 3 (*Score3*) to 12 (*Score12*)

Contrast of duration n with durations greater than n	*Mean*	*Foresight*	*Discretion*	*Foresight × Discretion*	*P1-P2*	*P3-P4*	*P5-P6*
$n = 3$	45.72	10.67	6.66	1.41	7.42	5.55	0.31
	(<.0001)	(0.002)	(0.002)	(0.249)	(0.008)	(0.021)	(0.578)
$n = 4$	26.43	13.18	2.23	1.21	2.24	13.01	1.89
	(<.0001)	(0.001)	(0.113)	(0.304)	(0.137)	(0.001)	(0.172)
$n = 5$	38.07	17.32	5.17	0.17	6.09	8.16	3.74
	(<.0001)	(<.0001)	(0.007)	(0.845)	(0.015)	(0.005)	(0.056)
$n = 6$	30.67	15.43	2.41	0.62	8.82	4.06	3.07
	(<.0001)	(0.000)	(0.095)	(0.540)	(0.004)	(0.047)	(0.083)
$n = 7$	0.63	1.77	0.46	1.47	4.19	0.08	0.03
	(0.430)	(0.186)	(0.630)	(0.234)	(0.043)	(0.781)	(0.869)
$n = 8$	0.00	4.27	0.50	0.75	3.25	2.38	0.05
	(0.970)	(0.042)	(0.608)	(0.474)	(0.074)	(0.126)	(0.829)
$n = 9$	4.04	1.34	0.41	0.23	0.11	1.72	0.20
	(0.047)	(0.251)	(0.666)	(0.795)	(0.741)	(0.193)	(0.656)
$n = 10$	4.85	2.84	1.14	2.85	4.96	0.83	1.82
	(0.030)	(0.095)	(0.324)	(0.063)	(0.028)	(0.364)	(0.181)
$n = 11$	0.15	16.27	1.22	10.77	32.65	1.77	0.17
	(0.709)	(0.000)	(0.299)	(<.0001)	(<0.001)	(0.187)	(0.680)

Note: *p*-values for each of the coefficients in the regression are in parentheses

8.5.2 Effect of duration on foresight × discretion profiles

Hypothesis H5 is re-examined by testing for the parallelism of profiles shown in Figures 8.2a to Figure 8.2c using scores from duration 3 to duration 12. The results for the sensitivity tests, presented in the second last column of panel A in Table 8.5, are consistent with those in the main analysis. In a high discretion environment, the profiles for both foresight groups are parallel, horizontal and equal. When discretion is reduced, the profiles for the two foresight groups cease to be parallel.

Panel B in Table 8.5 presents the parallelism results of profiles over duration 7 and duration 12. The second last column of the table shows that profiles *P3* and *P4* are horizontal and equal from duration 7 to duration 12. Although low foresight managers are unable to maintain their scores obtained at the start of the experiment, with moderate discretion, they are able to achieve scores that are similar to those of the high foresight managers at longer durations. In the main analysis, *P1* and *P2* are found to be parallel from duration 7 to 11. The sensitivity analysis indicates that *P1* and *P2* are not parallel from durations 7 to 12. The reason for the non-parallelism is likely due to the change in profiles between duration 11 and 12, as suggested by the significant Helmert contrasts for these last two durations (Table 8.8). There is an improvement in the final score for the low foresight group (*P1*), but there is a decline in score for the high foresight group (*P2*). Nonetheless, as in the main analysis, *P1* is still significantly below that of *P2* at duration 12.

Table 8.8 also presents the results on the Helmert contrasts for *P3* and *P4*, and *P5* and *P6* from duration 3 to duration 12. The Helmert contrasts from duration 3 to duration 11 are consistent with those in the main analysis (Table 8.6).

8.6 DISCUSSION

This chapter uses profile analysis to test hypothesis H5 which states that there is a significant effect of duration on the foresight × discretion interaction. Profile analysis is also used to test the specific predictions about the six foresight × discretion profiles. Hypothesis H5 predicts that in a low discretion environment, as duration increases, low foresight managers will find it more difficult to report smooth increasing earnings than high foresight managers. In a high discretion environment, low foresight managers experience less difficulty in reporting smooth increasing earnings at every duration. In the main analysis, the profiles from duration 2 to duration 11 are examined. The results from the sensitivity analysis, which examines scores from duration 3 to duration 12, generally corroborate the results from the main analysis. Both sets of results provide support for hypothesis H5.

Barth et al. [1999] and Hunt et al. [1997] document that few firms are able to show consistent smooth increasing earnings over time. This thesis finds that the interaction between discretion and foresight affects a manager's ability to report smooth increasing earnings over time. As duration increases, a limit on discretion makes it more difficult for low foresight managers to report smooth increasing earnings than high foresight managers. Low foresight managers experience a greater decline in the scores over the length of the smoothing duration than high foresight managers. At longer durations, the scores for the low foresight managers are significantly lower than those of the high foresight managers. In contrast, at a high level of discretion, the scores of both types of foresight managers at every duration are indistinguishable from each other. Even at moderate discretion, despite showing initial difficulty in maintaining smooth increasing

earnings, low foresight managers are able to report scores similar to those of the high foresight managers at longer durations. These results therefore extend the findings reported in Chapter 6 and 7 by showing that low discretion makes it more difficult for low foresight managers to report smooth increasing earnings as duration increases. This thesis therefore provides evidence in support of Hunt et al.'s recommendation that investors should evaluate the smoothness of a firm's earnings over a longer period in order to obtain more accurate inferences about the firm's quality. However, Hunt et al.'s recommendation is valid only under a low discretion environment because this thesis shows that when discretion is high, low foresight managers are able to report scores that are similar to those of high foresight managers.

9 CONCLUSION

9.1 SUMMARY OF RESULTS

This thesis employs an experimental approach to investigate (1) whether a reduction in accounting discretion leads to a separation in the earnings series reported by high and low foresight managers, (2) whether a reduction in accounting discretion impedes the ability of managers to communicate smooth increasing earnings to shareholders when operational techniques are available, and (3) whether the smoothing duration interacts with foresight and discretion to affect the ability of managers to report smooth increasing earnings.

Consistent with the prediction in Demski [1998], this thesis shows that a restriction in accounting discretion is effective in separating the earnings patterns reported by high and low foresight managers. The earnings reported by low foresight managers are relatively more variable than those reported by high foresight managers in a low discretion environment (Figure 5.1a in Chapter 5). Low foresight managers are affected by a lower discretion because they rely on accounting adjustments to achieve their reporting objective. These managers do not have the requisite knowledge to enable them to alter their operational decisions effectively. In contrast, high foresight managers are able to respond to a reduction in discretion by altering their operational investments to achieve their reporting objective. They invest less in R&D and more in advertising when accounting discretion is low, and they increase their investments in R&D when

accounting discretion is high. Consequently, high foresight managers are able to achieve their reporting objective despite a reduction in discretion.

The thesis also finds that low foresight managers make more income-increasing adjustments than high foresight managers, while high foresight managers are found to make more income-decreasing adjustments. The thesis additionally documents that high foresight managers use more accounting adjustments that have short reversal periods than low foresight managers when making income-decreasing adjustments in a low discretion environment. Low foresight managers, in contrast, use more accounting adjustments with long reversal periods than high foresight managers when reporting earnings upwards. The results in this thesis therefore extend the findings in Nelson et al. [2002a], Kasznik [1999], Burgstahler and Dichev [1997], Lilien et al. [1988] which show that managers tend to use income-increasing adjustments when managing earnings.

Finally, the thesis extends the finding in Barth et al. [1999] by showing that smoothing duration interacts with foresight and discretion to affect the ability of managers to smooth earnings. When discretion is high, at every duration, the scores of the low foresight managers are indistinguishable from those of the high foresight managers. In contrast, when accounting discretion is reduced, low foresight managers experience increasing difficulty in reporting smooth increasing earnings as the duration increases. The scores of the low foresight managers at longer durations are distinctly lower than those of high foresight managers. These results also provide support to Hunt et al. [1997] who suggest that observing smoothed earnings over longer periods provides investors with better inferences about a firm's quality.

The results from the sensitivity analyses generally corroborate with the findings from the main analyses. There are two sets of analyses that yielded weak results: (1) the use of standard deviation as a sole indicator of smoothing ability, and (2) the use of logistic regression to evaluate the likelihood that the manager obtains a particular level of score. As discussed in Chapter 7, the use of standard deviation alone is an incomplete measure of the overall smoothing performance of the manager, which focused on both the mean and standard deviation of the earnings change. The weak results in the logistic regression may be due to the coarseness in the categorisation of the scores of managers.

9.2 IMPLICATIONS OF THE STUDY

Several studies (e.g. Myers and Skinner [2002], Barth et al. [1999]) show that smooth increasing earnings are valued by investors. Managers of firms with little information about the future may be tempted to mimic such patterns of earnings in order to secure a higher stock price for their firms. One of the challenges of investors is to differentiate firms operated by high foresight managers from those operated by low foresight managers through an analysis of reported earnings patterns. Recall that low foresight managers lack information about future earnings and hence their patterns of smooth earnings do not convey their knowledge about the future. An implication of the results from this thesis is that in a low discretion environment, investors can rely on earnings patterns for an evaluation of the managerial type and hence the underlying value of the firm. Patterns of earnings, when evaluated over long periods, provide investors with a clearer indicator of the manager's type than patterns over a short period. At longer durations, the earnings patterns produced by low foresight managers are more variable

than those produced by high foresight managers. The results in this thesis also show that in addition to patterns of earnings, in a low discretion environment, an analysis of the type of discretionary accruals used by managers helps investors determine whether the smooth earnings are generated by a manager with high or low foresight.

Another implication of this thesis is that regulators should consider the impact of a tightening of accounting regulation on a firm's investment decisions. This thesis shows that a significant reduction in accounting discretion to prevent earnings management may leave managers with little choice but to manipulate operational variables in order to achieve the smooth increasing earnings patterns desired by shareholders. A manipulation of operational variables, however, may have a negative impact on the future performance of firms.

Using the earnings data before accounting adjustments, the ratio of the mean change in earnings per dollar of standard deviation for high foresight managers is 0.813 and 0.806 in a high and low discretion environment respectively. High foresight managers therefore experience a decline of $0.007 in mean earnings change per dollar of standard deviation as a result of using less R&D and more advertising in a low discretion environment. Although this experiment shows that the decline in earnings change per dollar of standard deviation is not substantial, it is likely that managing operational variables in practice would bring about negative effects on the long-term performance of a firm (Fields et al. [2001], Mande et al. [2000], Baber et al. [1991], Horwitz and Kolodny [1980]). The level of research and development expenditures made by firms, for instance, is found to affect a firm's productivity growth (Goto and Suzuki [1989]) and a firm's returns (Lev and Sougiannis [1996]). These long-term effects which can affect a firm's long-term survival

are not captured in the equation by Lev and Sougiannis [1996] that was used in the experiment to describe the relationship between investments and earnings. Hence, the long-term implications of a reduction in R&D cannot be properly assessed from the results in this thesis.

Given the two opposing effects of a reduction in accounting discretion, whether a restriction in discretion would improve the efficiency of capital markets depends on the frequency of earnings management used by managers to mislead shareholders. If accounting discretion is used primarily by managers to misrepresent their firm's future performance, like the low foresight managers in this thesis, a restriction in discretion would enhance the integrity of financial reporting. Alternatively, if accounting discretion is used mainly by managers to communicate their knowledge to investors (Healy and Wahlen [1999], Dye and Verrecchia [1995]), a reduction of discretion may impair the growth and competitiveness of the economy if more managers resort to the more costly form of smoothing - operational smoothing (Nelson et al. [2002a]). Regulation of accounting choices under these circumstances, would have undesirable consequences for the economy (Jamal et al. [2004], Jamal et al. [2003]).

There have been a few studies (Nelson et al. [2002b], Healy and Wahlen [1999]) that investigate the frequency of earnings management used by managers to mislead shareholders (or opportunistic earnings management). These studies show that this type of earnings management appears more frequently in some situations, but not in others. Burgstahler and Dichev [1997], find that between 30-44% of firms manage earnings upwards to avoid reporting losses, whereas only 8-12% of firms manage earnings upwards in order to avoid reporting an earnings decrease. Based on a study by Teoh et al.

[1998], Healy and Wahlen [1999] estimate that about 12% of firms engaged in initial public offering of shares manage earnings upwards. Subramanyam [1996], however, finds that on average, discretionary accruals are priced by investors. Using the assumption of efficient markets, he concludes that opportunistic earnings management is unlikely to be a frequent occurrence among firms. Unless additional evidence on the extent of earnings management used to mislead shareholders is available, a restriction of accounting choices should be implemented cautiously by regulators.

9.3 LIMITATIONS OF THE STUDY AND DIRECTIONS FOR FUTURE RESEARCH

One limitation of the experiment is that it focuses on the effect of a general reduction in discretion instead of the effect of specific forms of reduction in discretion on the reporting of smooth increasing earnings. A finding in experimental research on auditors' judgement is that the imprecision of standards encourages auditors to accept a manager's aggressive accounting treatment (see Nelson [2003] for a review). The presence of precise standards, however, creates opportunities for managers to structure transactions (Nelson et al. [2002a]), and for them to interpret evidence on transactions more liberally so as to avoid the infringement of accounting rules (Cuccia et al. [1995]). One possible extension of this thesis would be to evaluate how different methods of restricting accounting discretion can affect earnings management. For instance, such a study can examine the effect of having principles-based standards with strict auditing versus the effect of having rules-based standards.

A second limitation is that the accounting discretion limits for each participant in the experiment are held constant throughout the experiment. This assumes that the managers know exactly what the auditors would or would not allow with respect to their accounting provisions before any adjustments are made. Antle and Nalebuff [1991] suggest that financial statements are the outcome of negotiations between auditors and managers. The available discretion may vary each period because of these negotiations. How negotiation between the auditors and managers affects the ability of managers to manage earnings is another possible avenue for research.

The third limitation of the experiment is the focus on the information level of managers instead of the incentives of managers. Although several studies (Kirschenheiter and Melumad [2002], Hunt et al. [1997]) show that the knowledge of managers is closely related to a manager's use of smooth earnings to communicate with shareholders (hence, to maximise the value of the firm), there may be managers who utilise this knowledge for their personal benefits. Future studies may want to examine how different incentives of managers affect the management of earnings. If these studies adopt an experimental approach, one possible experimental design would be to require one group of managers to report earnings to mislead shareholders and another group to present a truthful report. The difficulty with this design is that it would require the first group of participants to engage in what might be considered an unethical act. This ethical issue has to be addressed before such an experiment can proceed.

The fourth limitation is that the experiment focuses on only a single motivation for earnings management, which is to generate a smooth increasing stream of earnings for shareholders. Managers are likely to face competing demands from compensation

contracts, debt covenants and investors when generating financial reports (see Fields et al. [2001] for a review). There are a few studies that examine how banks manage transactions and accruals in order to satisfy tax requirements, bank regulations and earnings targets (Beatty et al. [1995], Collins et al. [1995], Moyer [1990], Scholes et al. [1990]). These studies however, do not evaluate the impact of accounting discretion on a manager's ability to trade off external and internal incentives. Future studies can address these additional issues.

Last, the thesis does not consider the effect of shareholder's pricing of the earnings patterns on a manager's smoothing decisions. Future studies can enrich the financial reporting structure used in this thesis by incorporating interactions between capital markets and managers.

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A APPENDIX A: INFORMATION LETTER AND CONSENT FORM

Effect of Accounting Discretion on Operating Decisions of Managers

You are invited to participate in a study on the effect of accounting discretion on operating decisions of managers. This study is part of our broader research agenda that seeks to examine how accounting standards (GAAP), level of investor sophistication, and governance structures (e.g., control of the board of directors) influence operating and financial reporting decisions of managers. This is the first study in a new program of research – later studies will incorporate more detailed institutional features of governance and markets.

Nature of participation

In this study, you will adopt the role of a CFO of a computer simulated company. Your task is to maximize your reported score which is based on a formula which rewards you for every dollar of reported earnings and penalizes you for every unit of variance in reported earnings across periods (essentially rewards you for reporting a nice smooth pattern of income over time). You will be given an initial cash endowment and be asked to make operating decisions such as deciding how much money should be allocated to advertising, R & D, and purchase of new machinery and equipment. We have designed a computer algorithm which will translate your operating decisions (e.g., invest $1 in advertising in year 1) into earnings for the current and future years. In addition, we ask you to make some accounting judgments (e.g., estimate a bad debt allowance, make capitalization vs expense decisions). You will be given some discretion in making these accounting judgments, but the amount of discretion is bounded to reflect the role of GAAP and auditors in financial reporting.

We will provide a training session to help you understand the impact of your operating decisions on both current period and future period earnings. The training session will cover the nature and impact of operating decisions, the bounds of discretion available for accounting judgments, and how accounting accruals "reverse" over time. In the actual experiment, you will play this simulated game at least 12 times (i.e. *12+* periods), so you will learn how the simulation works over time. Your objective is to maximize your cumulative score over the 12+ periods. The experiment should take approximately one and a half hour of your time.

The experiment has a "Between-Subjects" design whereby some participants will have a better understanding of the simulation (high foresight) than others (low foresight). The amount of discretion in GAAP, and the variability of the earnings process of the simulated company, will also vary between participants. Your "score" in this experiment has no direct meaning. We will compare the "score" of participants in different experimental conditions to develop an understanding about the impact of managerial foresight, amount of discretion in GAAP, and variability of the industry.

Types of reward

Each participant will be given a University of Alberta School of Business pen as a token of appreciation for participating in the study. Since we believe that expert participants are likely to be motivated to do well more by reputation and a desire to win (rather than just dollars), we will also provide the top 3 winners in each foresight condition (high foresight, partial foresight) with a University of Alberta School of Business silver clock. We have also made arrangements to publish an article about the experiment in the quarterly ICAA newsletter. As part of this article, we can publicize the names and photographs of the top 3 winners. The top 3 winners will be asked to sign a second consent form where explicit permission is provided so that we can use names and photographs to publicize results of the experiment. No publicity action will be taken if the winners decline.

Protection of participant's identity

Your name and the name of your firm will not be identified in any research reports based on this study. All the operating decisions and accounting judgments that you make will be confidential. At the time of the experiment, we will record your name and your score to determine the winners. After the winners have been determined, we will destroy all records that link your name to your responses. After the end of the experiment, no one (including the research team) will be able to connect your responses with your identity. Only aggregate results will be used in research paper(s) which will be presented at conferences, and published in academic and professional journals. Data obtained in this study may also be used for teaching and Ph.D dissertation research. The data from this study will be recorded in a database. To ensure confidentiality, access to this database will be controlled by the principal researcher, Dr Karim Jamal, CA. Data will be made available to other researchers, and current and future Ph.D students who work with Dr Jamal on research projects regarding corporate governance and accounting standards. The database will contain only an identifier indicating your role (e.g., CFO in firm 1, CFO in firm 2) but not your name.

We have asked you to sign the consent form as evidence that you have agreed to participate in this study, so we will have a record of your name. Only the principal researcher will have access to these signed consent forms. Please note that after rewards are distributed, there is no way to link your name with your responses in the experiment, so no one, including the principal investigator will be able to associate your name with the data collected. The data from this project will be kept indefinitely. The operating decisions, and accounting choices provided in the study have been deliberately structured to require judgement, so there is no right or wrong judgement. The measures taken to protect your identity, and the judgmental nature of the tasks you undertake, would minimise the potential for any harm that the study would cause you as a result of participating in this study.

Participation and the right to withdraw

We appreciate the co-operation of your Company in giving us this opportunity to solicit your participation in this experiment. We have approached only a limited number of senior accounting decision makers to participate in the study, therefore your

participation is very important to us. Your decision to participate or not, however, will not prejudice your future association with me, Dr. Karim Jamal, my colleagues in the School of Business, or the University of Alberta. The University of Alberta research ethics guidelines require that your participation be voluntary, and that you be free to discontinue your participation at any time during the study without any penalty. If you choose to withdraw from the experiment (during or after the experiment), we will destroy all of your data. If you have any questions or concerns about this study, please contact me by phone (780–492–5829), fax (780–492–3325) or e-mail: karim.jamal@ualberta.ca. You can also contact Dr. David Cooper, a member of the Research Ethics Board in the School of Business, by phone (780–492–5413) or e-mail: david.cooper@ualberta.ca.

Your signature indicates that you have read the information provided above and have agreed to participate in the study. After signing the form, should you decide not to participate in this study, you may withdraw at any time and without prejudice. If you wish to obtain a copy of research paper(s) based on this study, please enclose your business card. We would be very happy to provide you with a copy. If you would like to be placed on a mailing list to receive summaries of future research studies on related topics, please indicate your desire to be placed on our mailing list.

Thank you for your assistance on this project.

----------*Tear here*----------

Consent Form

I acknowledge that I have read and understood the information contained in the Information Letter, and agree to participate in this study on "Effect of Accounting Discretion on Operating Decisions of Managers."

---------- ----------

Name of Participant Date

Signature of Participant

Consent To Publicise Names and Photographs of The Winners in the Experiment

The researchers wish to write an article explaining the nature of the experiment and its results for the ICAA newsletter. As part of this article, we would like to identify names of winners and publish photographs of the winners.

I hereby consent to having the following information disclosed publicly in articles written about this experiment (Place an X beside one of the options provided):

---------- Do not disclose any personal information about me.

---------- You can disclose my name only.

---------- You can disclose both my name and use my photograph.

---------- ----------

Name of Participant Date

Signature of Participant

----------*Tear here*----------

Participant No: _____

Name of participant: _____

Note: The above information is obtained for reward purposes only. This form will be destroyed after winners are identified.

B APPENDIX B: INSTRUCTIONS FOR THE EXPERIMENT

THE EXPERIMENT

I. Overview of Experiment

Your Task

You are appointed as the Chief Financial Officer (CFO) of a firm. Your task is to ensure that the earnings of your firm show a smooth increasing trend over time. To complete this task, you make two sets of decisions: operating decisions and accounting decisions. Operating decisions are made at the *beginning* of the year. You will be given a sum of money at the start of the experiment to invest in assets over time. Accounting decisions are made at the *end* of year, after earnings from your investments have been realized. You will decide how much adjustments should be made to accounting allowances and provisions.

A score has been developed to measure your performance. This score captures both the change in earnings and its variability over time. (see Score)

Sessions

There are two sessions to the experiment: training session and actual session.

- **Training session**

You will be provided a training session in which you familiarize yourself with the program.
For this session, your initial endowment and time frame is:
Initial endowment = $10,000
Time frame = 5 years

- **Actual session**

Once you have completed the training program, you will participate in the actual experiment.
For this session, your initial endowment and time frame are:
Initial endowment = $80,000
Time frame = Not less than 12 years.

II. All about Investments

- **Type of investments**

At the beginning of the experiment, you will be given a sum of cash to invest in the following assets:
- Equipment
- Research and Development (R&D)
- Advertising.

Operating revenue

Investments in any of these assets will provide operating revenue for the firm. Operating revenue is the revenue from investments net of all expenses except depreciation, advertising and R&D expenses. Operating revenue in any year is computed as:

Actual operating revenue in year (1) =
0.155*Equipment stock at beg. yr 1 + 1.055*Advertisement at beg. yr 1 +
0.224*R&D(beg. yr 1) + 0.347*R&D(beg. yr 0) + 0.386*R&D(beg. yr -1) +
0.360*R&D(beg. yr -2) + 0.288*R&D(beg. yr -3) + 0.363*R&D(beg. yr -4) + random factor.

Explanation of equation

- Total *Equipment Stock* at beginning of year - 15.5% per year
  If equipment stock is $1000, revenue from equipment = $155 per year in the current year and future years.

- A dollar invested in *Advertising* in the current year provides $1.055 in revenue in the current year.

- A dollar invested in *R&D* in current year, will provide $0.224 revenue in the current year ,
  $0.347 one year later,
  $0.386 two years later,
  $0.360 three years later,
  $0.288 four years later, and
  $0.363 five years later.
  Total revenue from investing in $1 of R&D in current year = $1.968

- The random factor is normally distributed with mean = 0 and a standard deviation of 5%.

Example:

At the start of the experiment, the computer assigns a distribution of mean zero and standard deviation of 5% to you. In each period, a number will be randomly picked from the distribution. To illustrate, assume that in period 1, the actual random factor picked from the distribution is +15%.

Operating revenue before the random factor	= $1000
Actual random factor	= 15%
Actual operating revenue	= $1150

Any cash balance that is not invested in real assets will earn an interest of *0.5% per annum*. The amount of operating revenue and interest will be added to your existing cash balance and made available for investment in the next period.

- **Operating expenses**

Operating expenses related to investments:

Equipment	- depreciation of 10% per year
R&D	- expensed entirely when incurred
Advertising	- expensed entirely when incurred.

III. All about Accounting Adjustments

• **Discretion limits**

You are randomly assigned a discretion limit. The amount of discretion is given as a of percentage of operating earnings before any accounting adjustments. For instance, a 5% discretion limit means that you are able to increase earnings by a maximum of 5% using accounting adjustments.

An auditor normally allows more discretion to firms making increases in provisions. To reflect this, the limit for increases in provisions is computed as 1½ times the limit for reduction in provisions.

Example

Auditor's limit for *reduction* in allowance = 5% of earnings.
Limit for an *increase* in provision = 5% x 1½ = 7.5% of earnings per year.

• **Type of adjustment**

You may use the discretion allowed by auditors to adjust three types of accounting provisions:
- Allowance for Bad Debts
- Provision for Restructuring
- Provision for Retirement Benefits.

• **Effect of adjustment on current earnings**

Any adjustments you make to these accounting provisions will have an effect on current earnings as well as future earnings. For instance, if you reduce the allowance for bad debts by $200, current earnings will increase by $200. Conversely, an increase in allowance would reduce current earnings.

• **Effect of adjustments on future earnings**

An adjustment to provision in the current period will have an impact on future earnings. These 'reversals' will take place over a period of time. The reversal structure for the provisions is as follows:

Bad Debts - 1 year
Restructure - 5 years
Retirement - 10 years

For the above example, period 2's earnings will reduce by $200. Given that you made less provision than necessary in Period 1, when bad debts actually occur in period 2, there will not be enough provision in the Allowance for Bad Debts. As a result, earnings for the next period will decrease.

IV. Operating Revenue and Earnings

The relationship among operating revenue, operating earnings before accounting adjustment, and reported earnings is illustrated below:

Operating revenue from investments		$1000
add: interest revenue		50
Total operating revenue		$1050
less Operating expenses		
Depreciation	$80	
R&D	$50	
Advertisement	$20	150
Operating earnings		$ 900
less: Reversals of previous adjustments		
Bad debts	$40	
Restructuring	$30	
Retirement	$20	90
Operating earnings before current accounting adjustments		$810
add: Current year adjustments		
Reduction in bad debts	$30	
Reduction in restructuring provision	$20	
Reduction in retirement benefits	$10	60
Reported earnings		$870

The Reported Earnings will be used to compute the Score.

V. Score

Your objective is to smooth earnings over at least 12 periods. The SCORE is developed to measure your ability to achieve this objective. The SCORE given by:

Score = Mean of change in earnings - Standard deviation in change of earnings.

The score is calculated cumulatively. This means that past decisions have an impact on your current score. A large positive SCORE indicates a smooth earnings stream.

- **How the SCORE works**

Example 1 (constant change in earnings)

Period	**1**	**2**	**3**	**4**	**5**
(a) Earnings	200	205	210	215	220
(b) Change in earnings		5	5	5	5
(c) Mean of (b) over time		5	5	5	5
(d) Standard deviation in (b) over time		0	0	0	0
(e) SCORE (c) - (d)		5	5	5	5

Example 2 (increasing change in earnings)

Period	**1**	**2**	**3**	**4**	**5**
(a) Earnings	200	205	215	227	242
(b) Change in earnings		5	10	12	15
(c) Mean of (b) over time		5	7.5	9	10.5
(d) Standard deviation in (b) over time		0	3.5	2.94	3.64
(e) SCORE (c) - (d)		5	4	6.06	6.86

C APPENDIX C: MANIPULATION CHECK FORM FOR TRAINING SESSION

Questionnaire

Question 1
In general, how* well do you understand *the effect of your investment decisions on the magnitude and persistence of future earnings? Use a number corresponding to the scale below to answer the following questions. 1---------2---------3---------4---------5---------6---------7---------8---------9 I do not know at all — I know extremely well
(i) How well do you understand the effect of investing $1 in Equipment on the *(a)* magnitude *of future earnings?* _____ *(b) number of period of benefits* (persistence)*?* _____
(ii) How well do you understand the effect of investing $1 in Advertising on the *(a)* magnitude *of future earnings?* _____ *(b) number of period of benefits* (persistence)*?* _____
(iii) How well do you understand the effect of investing $1 in R&D on the *(a)* magnitude *of future earnings?* _____ *(b) number of period of benefits* (persistence)*?* _____

D APPENDIX D: MANIPULATION CHECK FORM FOR ACTUAL SESSION

Questionnaire

Question 1
In general, how* well do you understand *the effect of your investment decisions on the magnitude and persistence of future earnings? Use a number corresponding to the scale below to answer the following questions. 1--------2--------3--------4--------5--------6--------7--------8--------9 I do not know at all — I know extremely well
(i) How well do you understand the effect of investing $1 in Equipment on the *(a)* magnitude *of future earnings?* _____ *(b) number of period of benefits* (persistence)*?* _____
(ii) How well do you understand the effect of investing $1 in Advertising on the *(a)* magnitude *of future earnings?* _____ *(b) number of period of benefits* (persistence)*?* _____
(iii) How well do you understand the effect of investing $1 in R&D on the *(a)* magnitude *of future earnings?* _____ *(b) number of period of benefits* (persistence)*?* _____

2 *Which degree / professional designation do you hold? Please check [✓] all that apply.*

B.Comm *MBA* *CA* *CMA* *CGA* *Others (Please specify)* _____

3 *How much experience do you have in accounting / financial reporting ?* _____ *years* _____ *months*

4 *What is your current rank in the firm?*

_____

5. *What is the size of your firm based on the 2001 financial statements? (in Can $)*

Total Assets _____ *Total Revenue* _____